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# ANNUAL REPORT
OF THE
NEBRASKA
STATE BOARD OF AGRICULTURE.

1889.

*By ROBERT W. FURNAS.*

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# ANNUAL REPORT

# NEBRASKA

# STATE BOARD OF AGRICULTURE,

## FOR THE YEAR 1889.

PREPARED BY

**ROBT. W. FURNAS,**

SECRETARY NEBRASKA STATE BOARD
OF AGRICULTURE.

LINCOLN, NEB.:
STATE JOURNAL COMPANY, PRINTERS.
1890.

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THE STATE BOARD OF AGRICULTURE,
OFFICE OF SECRETARY,
BROWNVILLE, NEBRASKA, February 7, 1890.

*His Excellency, John M. Thayer, Governor of Nebraska:*

SIR—In compliance with law in this case made and provided, I hereby transmit the annual report of the Nebraska State Board of Agriculture for the year 1889.

Very respectfully,

ROBT. W. FURNAS, *Secretary.*

# PROCEEDINGS.

## SEPTEMBER MEETING OF THE BOABD.

LINCOLN, September 10, 1889.

In compliance with law in this case made and provided, the President having fixed the day and place for meeting, the Nebraska State Board of Agriculture met at the city-council chamber, Lincoln, on the evening of the date above written.

PRESENT, OFFICERS—R. R. Greer, *President;* E. N. Grennell, *First Vice President;* J. B. McDowell, *Second Vice President;* L. A. Kent, *Treasurer;* R. W. Furnas, *Secretary;* A. Humphrey, *General Superintendent;* W. R. Bowen, *Superintendent Gates;* Frank H. Young, *Superintendent Amphitheater.*

MEMBERS OF THE BOARD PRESENT—J. D. Macfarland, Ed. McIntyre, J. M. Lee, S. H. Webster, M. L. Hayward, J. Jensen, E. A. Barnes, J. B. Dinsmore, M. Dunham, R. H. Henry, J. S. Hughes, C. K. Lawson, J. C. Warner.

Barker and Barstow were excused from attendance.

PRESIDENTS FROM COUNTY SOCIETIES PRESENT—W. R. Davis, Chase county; E. Allen, Douglas county; J. Jensen, Fillmore county; C. D. Shrader, Logan county; F. H. Maul, Saunders county; R. H. Henry, Platte county; J. D. Courtwright, Seward county.

In the matter of the World's Fair, the following preamble and resolutions were unanimously adopted:

WHEREAS, The question of celebrating the 400th anniversary of the discovery of America, instituting and holding a World's Fair, at which all nations shall be represented, is now being agitated; and

WHEREAS, The location of this great exposition will depend upon the action of Congress, designating the preference of the country when it makes the appropriation to aid the enterprise; therefore,

*Resolved*, That our Representatives to Congress be requested by this State Board of Agriculture to use their active and persevering efforts in securing this location in Chicago, as in our judgment such location will afford foreign representatives who visit the exposition the only adequate facility to see America.

Two propositions were filed in the matter of locating the Nebraska State Fair for the next five years—from Lincoln and Grand Island. On motion, they were not opened, and returned to parties presenting, and all further proceedings in the matter postponed until the regular annual meeting of the board at Lincoln on the third Tuesday in January, 1890. The Secretary was directed to advertise, giving notice through same medium as before, thirty days before the meeting of the board, asking proposals for locating State Fair five years, commencing with the year 1890. Proposals to be sealed and filed with the Secretary on or before said meeting.

On motion, R. W. Furnas was appointed as delegate to the Western Fair Circuit Association, at Chicago, in November next, and also to the International Association of Fairs and Expositions, at Milwaukee, Wisconsin, during the same month, his actual expenses to be paid by this board. J. B. Dinsmore was appointed delegate to the American Short-horn Breeders' Association, to meet in Chicago during November, his actual expenses to be paid by this board.

The President was authorized at his pleasure to appoint two additional delegates to attend the various meetings at Chicago during the fat-stock show, their expenses to be paid by this board.

The President was suthorized at his pleasure to appoint a committee of five to revise and correct the constitution, by-laws, rules, regulations, and premium list, to report to the coming January meeting. Said committee to meet at their pleasure, any time before the annual meeting at which it is to report.

On motion, all delegates sent out by this board are required to render a written report at the next meeting of the State Board.

It was agreed that the Nebraska State fair dates shall follow those of Iowa, as heretofore.

Greer, Dinsmore, and Furnas, were appointed a committee to receive and entertain visiting officials from the Iowa State Board of Agriculture, who are to visit our fair this week.

In due time President Greer appointed R. H. Henry as delegate to the Consolidated Cattle Growers' Association, to convene at Chicago in November, 1889, and J. B. McDowell as delegate to the National Swine Breeders' Association, to meet at same place and date.

As President Greer and Manager McIntyre were going to Chicago, your Secretary assumed the responsibility of duly accrediting the former as delegate to the American Association of Importers and Breeders of Belgian Draft Horses' meeting at Chicago, and the latter as delegate to the convention of Holstein Breeders.

Mr. Henry, by reason of sickness, could not attend, and Mr. Dunham was delegated in his place.

President Greer announced the following committee to revise the Premium List and to report to the winter meeting, January 21, 1890:

J. B. Dinsmore, *chairman;* E. A. Barnes, M. Dunham, R. H. Henry, and R. W. Furnas.

# ANNUAL MEETING OF THE NEBRASKA STATE BOARD OF AGRICULTURE.

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LINCOLN, January 21, 1890.

In compliance with provisions of law in this case made and provided, the Nebraska State Board of Agriculture convened in University Chapel, Lincoln, Nebraska, the date above named, being the third Tuesday in January, of that year.

R. R. Greer, *President*, called the meeting to order at 4 o'clock P. M. Robert W. Furnas, *Secretary*.

The roll was called. The following officers were found to be present:

R. R. Greer, *President;* E. N. Grennell, *First Vice President;* J. B. McDowell, *Second Vice President;* Robt. W. Furnas, *Secretary;* Austin Humphrey, *General Superintendent;* Wm. R. Bowen, *Superintendent of Gates;* O. M. Druse, *Master of Transportation;* S. H. Webster, *Superintendent of Agricultural Hall;* E. N. Grennell, *Superintendent of Art Hall;* Frank H. Young, *Superintendent Amphitheater;* Chas. E. Bessey, *Botanist;* Lawrence Bruner, *State Entomologist.*

Mr. Kent sent the following excuse for non-attendance, and was excused.

"MINDEN, NEB., January 20, 1890.

"*Mr. President and Gentlemen of the State Board:* For fifteen years I have never missed a roll-call at annual meetings, or failed to report for duty State-Fair week.

"I have faced Nebraska blizzards for twenty winters; stolen wood from Uncle Sam's so-called military islands in Platte river; have subsisted upon wind, sand, and grasshoppers, for many years; have chased buffalo and Texas steers for exercise; have given all my stock of provisions to 'Lo, the poor Indian'; have gone unarmed across the prairies where mountain lions were reputed to attack locomotives and brakemen. In fact, gentlemen, have dared to meet and tackle every new invention, scheme, or device, presented by friend or foe, save and alone excepting the so-called 'mineral water,' bottled fifteen feet underground at or near Lake Kearney. (I am no relic of the dark ages.) But alas! gentlemen, in an unguarded moment, and without the advice of counsel, my heroic conquests led me to seek new and foreign foes more worthy of my steel, and I challenged a gentleman of 'French nativity' and 'Russian ancestry' for a friendly set-to, Marquis of Queensbury rules, in a sixteen-foot room — 'La Grippe.' He came; preliminaries were arranged; he struck me a foul; not allowed by referee; time called.

"Mr. Chairman, can I be excused? L. A. KENT."

The following members of the State Board were present and answered to their names:

J. D. Macfarland, Ed. McIntyre, J. B. McDowell, S. M. Barker, J. M. Lee, S. H. Webster, R. R. Greer, M. L. Hayward, A. J. Leach, H. Piasecki, W. R. Bowen, R. B. Windham, R. W. Furnas, E. N. Grennell, J. Jensen, E. A. Barnes, J. B. Dinsmore, M. Dunham, R. H. Henry, J. S. Hughes, W. H. Barstow, R. W. Blake, A. Humphrey, Frank H. Young, Charles K. Lawson, and J. C. Warner.

Edward Blewett, the member of the board from Dodge county, tendered his resignation, as follows, which was accepted:

"FREMONT, NEB., September 10, 1889.

"*To the Honorable Board of Directors of the State Agricultural Society, Lincoln, Neb.:* GENTLEMEN—Owing to the pressure of other business, I am unable to give the time necessary to the performance of the duties incumbent upon me as a member, and I hereby tender my resignation, to take effect at once; and I hope that my successor may be able to give more attention to the business of the society than I have been able to. I am, yours truly,

"EDWARD BLEWETT."

Prof. L. E. Hicks, Dean of the Industrial College, and Director of the Experiment Station, welcomed the convention, as follows:

## ADDRESS OF WELCOME.

"*Mr. President and Gentlemen of the State Board of Agriculture:* On behalf of the Regents and Faculty of the University of Nebraska, I give you a hearty welcome to this hall. The acting Chancellor, Prof. Bessey, regrets that a slight illness prevents him from performing the pleasant duty of greeting you in person, and I am sure you all share that regret. We hope that your session here may be a pleasant and profitable one, and that the interests of agriculture, the foremost industry of this great and prosperous commonwealth, may be promoted by the acts and deliberations of this meeting, and these interests may continue to prosper under the fostering care of this board as they have in the past."

President Greer, in a few well-chosen words, responded to the welcome.

On motion, a committee of three was appointed by the President, on credentials. Committee: J. Jensen, of Fillmore county; J. S. Hughes, of Hayes county; M. L. Hayward, of Otoe county.

The committee in due time submitted the following report, which was adopted, except as to admitting more than one representative from any one county, or recognizing more than one organization in any one county.

"MR. CHAIRMAN: Your Committee on Credentials beg to report as follows: We find that reports have been made by the following counties, as provided by law, and that the gentlemen therefrom, named below, are entitled to seats in this body, either as a President or delegate duly elected.

| | |
|---|---|
| Adams | A. H. Cramer, delegate. |
| Antelop | A. J. Leach, delegate. |
| Banner | S. M. Smith, President. |
| Box Butte | L. W. Gilchrist, President. |
| Brown | C. R. Glover, delegate. |
| Buffalo | E. J. Hubble, President. |
| Burt | H. Jagar, President. |
| Butler | S. Schramm, President. |
| Cass | F. Gorder, President. |
| Chase | C. W. Meeker, delegate. |
| Clay | M. S. Price, President. |
| Colfax | O. Nelson, President. |

| | |
|---|---|
| Cuming | J. S. Neligh, President. |
| Custer | J. D. Ream, President. |
| Dawes | Chas. A. Grable, delegate. |
| Deuel | J. T. Enslow, President. |
| Dodge | W. L. May, delegate. |
| Douglas | E. Allen, delegate.* |
| Dundy | F. E. Swartz, President. |
| Fillmore | J. Jensen, President. |
| Franklin | H. M. Warriner, President. |
| Frontier | W. H. McCowan, President. |
| Furnas | L. Kissman, delegate. |
| Gage | F. H. Holt, delegate. |
| Gosper | G. B. Chase, President. |
| Greeley | P. H. Barry, President. |
| Hall | D. F. Jamison, President. |
| Harlan | L. H. Kent, delegate. |
| Hamilton | D. A. Scoville, delegate. |
| Hayes | H. Wiswall, President. |
| Hitchcock | W. D. Wildman, President. |
| Holt | M. Doolittle, delegate. |
| Howard | Adam Bricker, President. |
| Jefferson | E. L. Bowman, President. |
| Johnson | A. A. Carmon, delegate. |
| Kearney | James A. Cline, President. |
| Knox | W. C. Caley, President. |
| Lancaster | J. H. Westcott, President. |
| Lincoln | C. E. Osgood, delegate. |
| Logan | C. D. Schrader, President. |
| Madison | T. F. Memminger, delegate. |
| Merrick | S. M. Barker, delegate. |
| Nance | Mr. Lewis, delegate. |
| Nemaha | R. W. Furnas, delegate. |
| Nuckolls | J. M. Campbell, delegate. |
| Otoe | H. K. Larson, President. |
| Pawnee | N. S. Wright, President. |
| Phelps | R. T. McGrew, delegate. |
| Platte | J. E. North, delegate. |
| Polk | J. L. McKeever, delegate. |
| Perkins | C. H. Beaumont, President. |
| Red Willow | W. Coleman, President. |
| Richardson | G. A. Slayton, delegate. |
| Rock | R. W. Blake, President. |
| Saline | W. H. Barstow, President. |
| Sarpy | M. P. Brown, President. |
| Saunders | S. H. Moss, President. |
| Seward | J. B. Courtwright, President. |
| Sherman | James Rawley, President. |

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* D. H. Wheeler, President, afterward appeared.

| | |
|---|---|
| Thayer | S. L. Sperry, President. |
| Thomas | W. W. Cowles, delegate. |
| Valley | M. A. Showers, President. |
| Washington | E. S. Gaylord, President. |
| Webster | Joseph Garber, President. |
| York | Henry Frey, delegate. |

"In the matter of the contest from Chase county, the committee, after a full hearing, report:

"That the Chase County Agricultural Society, of which Mr. Meeker is its delegate, was duly organized as provided by law, in the year 1887, and has held fairs during the years 1887, 1888, and 1889, at Imperial, the county seat of said county, and Mr. Meeker is clearly entitled to a seat in this body. In 1889 another society was organized in said county under the name of the Chase County Agricultural and Horticultural Society, which society held a fair at Champion said year and which fair seems to have been (for a new county) quite successful. For this society Mr. Davis appears as the duly accredited delegate, he having been admitted to a seat in this body at the September, 1889, meeting thereof as the delegate from Chase county. Following a precedent at one time heretofore practiced of admitting more than one society from a county to a seat in this body temporarily, your committee have placed Mr. W. R. Davis among the list of persons entitled to a seat, and would recommend that he be admitted as a member of this body.

"In the matter of the contest from Saline county, the committee finds that in 1872 the Saline County Agricultural Society was duly organized, and that said society had every year since that time, except during the year 1889, held a fair of at least three days' duration at Crete, Nebraska. During said year of 1889, the society having become financially embarrassed, and a railroad threatening to build over and across its grounds, the holding of the fair was abandoned; but it seems to have held its meetings and elected its officers in order to keep up the organization, and the committee believes that Mr. Barstow, President of such society, is entitled to a seat, and would recommend his admission as a member of this body.

"The committee further finds that when said society failed to hold its fair, it was understood among other citizens of the county that it had abandoned its organization, and they in good faith, as it appears to the committee, proceeded to organize another society, under the same name as the former, and held a very successful fair at Wilber, the county seat of said Saline county. As a representative of this society, Mr. John N. Van Duyn, its President, claims a seat in this body, and following the same recommendations as in the Chase-county contest, your committee recommend that he be admitted as a member of this body.

"In making these recommendations, the committee would say that they are not clear as to whether this is the best method of settling these contests, and in case this report is adopted, such action should not be taken as an encouragement to organize more than one agricultural society in a county.

"One society and one good fair well patronized are surely better than two. That, in the very nature of the case, would require twice as much for preparations and expenses, and the holding of which generally tends to cause local jealousy and discontent.

"J. JENSEN.
"M. L. HAYWARD.
"JOHN S. HUGHES."

Samuel Barnard, President of the Pawnee County Agricultural Society, having died suddenly since the report from that county was rendered, on motion, N. S. Wright, the Vice President of said organization, was admitted to a seat as the representative from that county.

It was voted and ordered to be incorporated as one of the by-laws of the board, that hereafter this body can, under the State law governing this matter, recognize only one agricultural association in any one county, and can admit but one representative from any one county.

President Greer now read his annual address, as follows:

## PRESIDENT'S ANNUAL ADDRESS.

*Gentlemen and Members of the Nebraska State Agricultural Society:* As executive of the Board of Agriculture, according to custom it becomes my duty to review the work intrusted to us, and recommend a course to those who follow.

First, let us extend a welcome to those who join us for the first time by the reconstructions of county and district societies. Be free, gentlemen, to enjoy and reap the benefits of our annual meeting. Do not imagine that we, as a board, have learned all that is worth knowing; but feel at home, and give us fresh ideas and add zeal and energy to the session.

The noble pioneers who have struggled along and labored so earnestly during the dark days of this new, beautiful State, with the object in view to build up the agricultural interests and make the Nebraska State Agricultural Board one of the strong arms, is a general good to all, and the result of which to-day is that the far-eastern states point to Nebraska with pride, at the rapid progress which she has made. The beautiful homes, the fine, cultivated farms, the improved stock which now adorn what was, a short time ago, called the worthless desert. To you, pioneers, we extend cordial greetings, and ask your hearty co-operation in all measures, trusting that you may be spared for years to come, setting the same good example for the young as you have in years gone by.

In January of each year we hold our annual meeting, to secure a free interchange of views concerning new breeds and classifications of stock, the best manner of awards, the relation of the society to exhibitor and public, the best way to instruct and interest the people; in fact, to make the State Fair instructive as well as a pleasure, for the rich as well as poor, the big and the little, the old and the young; and the close of a State Fair is swiftly followed by preparations for another, until the year seems but as yesterday.

During the past year your Board of Managers have had several unpleasant obstructions come up before them, which, had they not been closely watched, and handled with care and judgment, would have made it almost impossible for the western counties to have attended the last State Fair with their large county exhibits. It has been one of the chief objects in this management to look after the far-western counties, to aid and encourage them in their agricultural pursuits, knowing at the same time it encouraged stock-growers of the more thickly-settled portions or the State, as the breeder of fine stock very readily sees and understands that the faster the western counties improve and develop, the sooner he could be at a valuable home market with his fine stock.

Your Board of Managers, as well as myself, felt keenly the disadvantages which they had to contend with, in the way of buildings, space, and room for the exhibitors. Knowing that the lease existing between the good citizens of Lincoln and the State Board, would expire at the close of the 1889 fair, they did not deem it prudent nor wise to expend money in making the necessary improvements. Notwithstanding the limited room which we had to offer our friends with county exhibits, the display, in quantity, quality, and variety, the arrangement of the same, and, in fact, the general appearance of the agricultural hall, was far superior to any year in the history of the State. It was grand, and was greatly admired by visitors from abroad, and it reflects great credit on Mr. Webster, the gentlemanly Superintendent of that department.

### THE CATTLE DEPARTMENT.

It was plain to be seen that the Superintendent, Mr. Dinsmore, had given his work a great deal of time and attention, with the aim in view to make the exhibitors from abroad, as well as those from our own State, feel at home, comfortable, and happy with us.

### HORSES AND MULES.

The Superintendent of this department, Mr. Milton Dolittle, seemed to be particularly adapted for the position; always on hand, and looking after the interests of the exhibitor, which made it pleasant for them, as well as gratifying to the Board of Managers.

### THE SWINE DEPARTMENT.

This is one we can all speak of with pride. The quality and number of swine on exhibition at our last State Fair would be a credit to a world's fair. The Superintendent, Mr. Trester, takes great interest in this department.

### THE IMPLEMENT DEPARTMENT.

There has been no year since my connection with State-Fair work, when the good feeling existing between exhibitors was so perceptible. It seemed as if the gentlemen who represented the various implements from different states and from different factories were all brothers, and had met for a family reunion. Your superintendent of this class, Mr. J. Doolittle, was the right man in the right place.

### POULTRY AND PET STOCK.

This department was a credit to any state, and the pleasant manner in which Mr. Megahan treated the exhibitors, as well as the visitors, made it very gratifying to the management.

### THE TEXTILE DEPARTMENT.

The lady in charge, Mrs. Pearsall, deserves great credit for the pleasant and agreeable manner in which she conducted this department. But few ladies would attempt satisfaction and harmony with a room so unfit for the ladies' handiwork as your board had to offer.

### FINE ARTS.

Mrs. Langworthy is the reliable standby in this department. It is needless to say that the manner in which she had the oil paintings displayed does a credit to her, as well as to the artists in this department.

And so we could go on through all the different departments and say many pleasant things of the superintendents, as well as the exhibitors. It seemed to me as if it was a general understanding with all to try and make the fair of 1889 one grand round-up of pleasure and enjoyment. It is true the society had not the amount of money on hand at the close of the 1889 fair that it had at the close of the fair of 1888, and the cause is plain to be seen. First, at your January meeting one year ago, the premium list was increased something like $2,000. The booth privileges did not pay the society within $1,800 of what they did in 1888, and the same with the hack privileges. I speak of this simply to show you that the general management during the year 1889 was not any more expensive than that of 1887 and 1888.

We are now out of a home, and drifting on the sea of uncertainty. It is for you, gentlemen, to select the landing. The lease on the grounds where the Nebraska State Board of Agriculture has held five of the most successful State Fairs in the history of Nebraska, has expired, and in making your selection for new grounds, be careful, and study well where the greatest number can be benefited and accommodated.

I would recommend that in your fitting up for the coming five years, that you build your agricultural hall on the broad gauge, as this State is still in its infancy, and settling up rapidly with the most enterprising, energetic, and intelligent people known to any state.

I further recommend that you arrange a building, large, roomy, and well-lighted, adapted for fine arts and textile fabrics. This department has never received the encouragement due the good mothers and daughters of our State. Give them a suitable building and they will display a variety of that handiwork which will be a credit to the society and a satisfaction to them.

In looking over the report from Ohio, Indiana, Illinois, Michigan, Wisconsin, and Iowa, I find you only pay our Secretary about one-half the salary paid by the above-named States. I would recommend that you allow our most worthy Secretary $600 extra for the coming year, which will enable him to employ a competent assistant.

Now, gentlemen, at the close of this year's labor, as I surrender this chair to my successor, allow me to thank your Board of Managers and Secretary especially for the hearty support and the many kind words of encouragement which you have extended to me all through the year. And to you, members of the State Board, one and all, sincerely I thank you. I have been conscious of your hearty support in every instance. All is peace and harmony and I return to you the office with that same warm feeling I had when I accepted it one year ago.

Treasurer Kent being sick, sent in his annual report as Treasurer, which was read by the Secretary, and was as follows:

## TREASURER'S REPORT.

*Mr. President, and Gentlemen of the State Board of Agriculture:* As your Treasurer, I herewith submit for your consideration the financial report of the society for the past year. The items of receipts I give you in detail, as it devolves upon me more than any other to furnish them. The items of expenses and premiums paid are so fully and clearly presented by our worthy Secretary's report, that it would be folly for me to again present them in detail. I therefore give you the mount of disbursements *in toto:*

| 1889. | RECEIPTS. | |
|---|---|---|
| Jan. 15. | Balance on hand | $9,656 03 |
| Feb. 12. | United States Commissioner of Agriculture | 12 30 |
| Sept. 13. | State apportionment | 2,000 00 |
| 13. | General admission tickets | 12,912 00 |
| 13. | Amphitheater tickets | 2,468 00 |
| 13. | Quarter-stretch tickets | 636 00 |
| 13. | Booth privileges | 2,823 08 |
| 13. | Hack stands | 420 00 |
| 13. | Camp permits | 264 50 |
| 13. | Supply wagons | 58 00 |
| 13. | Speed money | 3,824 82 |
| 13. | Stall rents | 916 70 |
| 13. | Programme and score-card permits | 115 00 |
| 13. | Speed fines | 87 65 |
| 13. | Additional premium list | 50 00 |
| 13. | Transportation of I. S. band | 88 20 |
| 13. | B. & M. coupons | 6,175 25 |
| 13. | U. P. coupons | 1,819 50 |
| 13. | F. E. & M. V. coupons | 921 50 |
| 13. | C. St. P. M. & O. coupons | 21 00 |
| | Total | $45,264 53 |

EXPENDITURES.

| | |
|---|---|
| Total number of warrants paid to date | $36,487 33 |
| Leaving balance on hand in treasury January 21, 1890 | 8,777 20 |

All warrants and vouchers paid and for which I ask credit at your hands, are herewith submitted and made a part of this report. All of which is respectfully submitted.

LEWIS A. KENT, *Treasurer*.

Secretary Furnas read his annual report, as follows:

## ANNUAL REPORT OF THE SECRETARY.

*To the President of the Nebraska State Board of Agriculture:* As required by law, I herewith submit the twenty-fourth annual report of the Secretary of this board. As at the last meeting, I repeat, with your consent, in matter of warrants issued, I will in reading, and for the moment, as more satisfactory, epitomize and classify expenditures. The detailed list of warrants, however, showing amounts of each, to whom and for what, and by what authority issued, accompanies, to go into the hands of an auditing committee for examination and report.

The total receipts and assets for the year 1889 were $45,257.03. There has been paid total in premiums, $15,523.70; other expenditures, $21,032.13; total paid, $36,555.83. Balance on hand December 31, 1889, $8,701.20.

Expenditures other than for premiums were:

Expenditures on grounds, $4,810.95. Under this head are included lumber, labor, material of all kinds, building, hardware, ice, straw, plumbing, fish aquariums, painting, repairs, cleaning grounds, telephone, switching cars, water, power, police and gate-keeper's pay rolls, and the like.

Salaries, $8,012.27. This includes all fixed salaries of President, Treasurer, Board of Managers, and Secretary; all pay rolls, except police and gate-keepers; all superintendents, judges, experts, speed starter, special police, clerks, committees, per cent paid booth manager, transportation, botanist, entomologist, actual expenses of delegates to other state and national associations, annual membership fees in national and international associations, and all in the employ of the board.

Printing and advertising, $4,631.72. This includes printing premium list, large and small hangers, flyers, dodgers, letter heads, postage prepaid, and printed envelopes and wrappers for all officers for the whole year; official badges, tickets, diplomas, writing diplomas, entry books, blanks for all purposes, tags, stickers, stationery supplies, pay and expenses of men on the road advertising and posting show bills in and out of the State; railroad and postal guides and directory, printed cards, live-stock score cards, wrapping paper, twine, shells, etc.

Hotel bills, $752.30. This includes all hotel bills for the year for the members of the State Board, at annual and semi-annual meetings, Board of Managers through the year, presidents and delegates to the annual meeting, and guests from other state associations visiting.

| | |
|---|---|
| Express, freights, and telegraphs | $436 02 |
| Postage | 237 75 |
| Insurance | 70 00 |
| Livery | 119 75 |
| Meal tickets | 49 80 |
| Forage | 423 95 |
| Attractions | 1,200 00 |
| Paid Mrs. J. T. Allan for books | 100 00 |
| Fines collected for other tracks | 140 62 |
| Errors corrected and fines remitted | 38 00 |

## THE FAIR OF 1889.

The annual fair for 1889 will ever be remembered as the best in all respects ever before held in the State; in fact, without a superior in few if any other of the older and more established. This was conceded by all candid and disinterested visitors and observers. Many veteran state, national, and international, fair-goers were free to pronounce it the best State Fair they ever attended. This was particularly so as to actual products of the farm. No finer was ever put on exhibition anywhere. Attendants, both as visitors and exhibitors, went home more universally pleased than before, feeling and expressing they had been gratified and benefited. This is and ever should be one of the prominent objects of intelligent fair management.

## ANNUAL REPORT.

Our annual report, printed volume, for 1888, I have edited, had printed, and copies are before you for use and distribution. Purposing in this to present an unusually interesting volume, I had printed in small type, and thus condensed, what heretofore would have made twelve to sixteen hundred pages, into 400, the unreasonable and arbitrary maximum limit fixed by law. I have distributed: to the members of this board, presidents and secretaries of county societies, county treasurers and clerks, and to each newspaper in Nebraska; in addition, to all other state and territorial kindred associations in the United States and Canada; to all agricultural papers in the world, and to all known public libraries in the United States. We are complimented by having it pronounced by disinterested persons an exceedingly interesting volume. Its outside demand is an evidence of its appreciation. Besides the foregoing enumeration, I have sent out on application, within the past ninety days, 1,235 copies, principally to other states, and quite a large number to foreign lands.

In this connection I beg again to call attention to the matter of obtaining and diffusing agricultural statistical information. It is of too great importance and of too much demand to permit further neglect. People in other portions of the country at large, whose eyes are turned in the direction of Nebraska, seek such information more than all else. Near 2,000 letters were received by me the past year, asking information in this respect. Hence attention is again called. What we publish annually is the very best obtainable, and while as reliable, perhaps, as most others, not excepting National tables, it is far from what it should be. Only one mode of obtaining such information can be in any degree reliable and correct. That is, the sworn officers of the state, while listing for assessment purposes, should at the time be required under penalty to collect and file detailed data, particularly as to acreage and crop yields of all kinds, their values, and the like. This board can do much to this end by pressing the matter to the attention of legislators, and should do it.

The board, in addition to its own proceedings and work, provides annually for the publication and distribution of the Nebraska weather and crop bulletins, by the director of the Boswell observatory, Doane college, Crete; United States signal service reports, from the officer in charge at Omaha; proceedings of all farmers' institutes in the State, obtainable; State Dairymens' Association; State Fish Commission; State Improved Stock-breeder's Association; State Experiment Station; State Bee-keepers' Association, and the investigations of animal diseases.

## OUTSIDE WORK OF THE BOARD.

The board, in addition to what is strictly its legitimate work, pays from its funds annually, in cash, to the State Horticultural Society, to aid in paying its premiums, $1,000; to aid in the botanical work of the State, $100; for entomological work, $50, and the past year $112.50 to aid the State Dairymen's Association to make its first exhibit at the American dairy show at Chicago in November last. These are matters not provided for by the State otherwise, as should be, and this board cares for them to the best of its ability. Permit the expressed belief that these are among its best expenditures.

In this connection allow attention to be called in that we much need some geological work. In a late conversation with Professor Hicks on this subject, I learn that much valuable data can be obtained at comparatively little expense — say an expenditure of $50 or $100 annually to defray actual expense of preparing for our annual publication. I advise that as in cases of Professors Bessey and Bruner, that Professor Hicks be appointed geologist for the board, with indicated appropriation for uses specified. No more valuable returns can be had, and which will benefit not only this board, but the people of the State, for so small expenditures as for botanical, entomological, and geological purposes.

## SPEED.

While personally, to no alarming extent, in love with prevalent usages of the more modern speed arenas, permit the assertion that the track under the managment of this board is as free from complaint and censure as any other in the country. In matters of receipts and expenditures connected with this class, and in simple justice to the management, I beg to present the following digest or explanation: it is often charged by those not conversant with the facts, that more money is expended on speed than for any other one factor of our exhibits. On all speed premiums, 10 per cent cash is charged on all entries. For 1889, in the speed class, $6,000 was offered in premiums, and $5,850 paid. On the largest purse offered — $1,000 — $1,075 was received as entrance fees, a net profit on that purse of $75. We received total entrance fees for the last fair, $3,676; for speed stalls we received $251; our amphitheater receipts were $2,463.75; quarter-stretch receipts, $636; total receipts, $7,026.75. Deduct amount actually paid — $5,850 -- and we have a balance in our favor of $1,176.75. Deduct from this for incidental expenses of speed ring, starter, judges, and some track work, not to exceed $450, and the showing is a net profit of $726.75 for the year 1889. This year, it is but fair to say, was better than the average. It is, however, safe to state that speed, in fact, does not cost the board a single cent any year.

### FARMERS' INSTITUTES.

Farmers' Institutes are, and long have been, of such vital importance that Nebraska should in this respect be thoroughly organized. There is scarce any other organization that can be made of more practical and lasting benefit to the general farming interests. In states where greatest good has resulted, this factor in agricultural work has been especially fostered and provided for by state appropriations. This board, as is well understood, has no means at command, or at its disposal, with which it can aid to any considerable extent. It has, however, thus far provided for the publication and diffusing of all valuable papers and discussions, when obtainable. It can further lead in pressing the matter to the attention of the Legislature, to the end that work in this direction be no longer delayed.

I am officially advised by the management of the Experiment Station for this State, that it will cheerfully join in any movement, and aid all in its power. Would it not be advisable on the part of this board to appoint a committee of conference at this meeting to aid in devising plans for organizing and conducting farmers' institutes in every county in the State? Let not Nebraska be longer behind in this progressive movement.

### OUR CORN SHOW AT PARIS.

The corn on exhibition at our last winter meeting I had carefully packed and shipped to C. V. Riley, who had in charge the agricultural department of the United States exhibit at the late Paris Exposition. He advised me that it reached France in good condition, was given a prominent place, and attracted marked attention. Such was the favorable impression made that I recently received an official letter from Paris, asking that the exhibit now in place in Grant Memorial hall be sent there to be taken to Edinburgh and Vienna, for exhibition. Applications are also on file for this collection to be distributed in our own states East. With your permission, and that of the exhibitors, I will make the most advantageous disposition of it possible.

### THE COMING WORLD'S FAIR.

The coming world's fair and exposition demands and should receive Nebraska's earnest and prompt attention. This Board of Agriculture has ever, heretofore, led the van in matters of advertising the State. It should not fail to inaugurate a new move in this direction now. While the young State keeps step in the onward march, not a whit behind any other, the old truism should prompt to continued and unremitting effort. It is said, and truly: "When an individual or people cease to grow, they commence to die." This State, yet in its infancy, as it were, cannot afford to cease to grow. What is done in this respect should be commenced at once — now. It will require all time between the present and the year 1892 to prepare and present such a showing as should be and can be made. Keep Nebraska before the world — to the fore.

## RETROSPECTIVE.

As we have rounded up a five-year term of fairs, brief retrospection is not only admissible, but desirable.

The first of the five years, 1885, we commenced with a balance in hand of $712.35 and closed with a balance of $9,938.50, a gain of $9,225.75 With this balance for 1886, we closed with $8,972.01, a decrease of $966.49. For 1887, with this balance to commence with, we closed with $8,274, a loss of $698.01. For the year 1888, with the balance indicated, we closed with $9,656.03, a gain of $382.03. For 1889, our balance being as shown, we close with $8,701.20, a loss of $954.83.

As will be seen, the first year at Lincoln gave us a handsome balance. At that fair all accommodations were furnished and provided by the Nebraska Exposition Association, owning the grounds, and the State Board management was at no expense fitting up the grounds. Since then, for the four succeeding years, what is known as expenses of the grounds have been: for the year 1886, $5,224.84; for 1877, $4,394.98; for 1888, $3,652.99; for 1889, $4,810.95; a total of $18,083.76.

The total receipts or assets from all sources:

| | |
|---|---|
| 1885 | $32,402 68 |
| 1886 | 42,671 11 |
| 1887 | 44,244 61 |
| 1888 | 41,213 81 |
| 1889 | 45,257 03 |

As the board is not engaged in commercial pursuits or ventures seeking profits, its purpose has been to keep abreast with the enterprise and demands of the day and hour. Hence the aims merely to defray expenses and present as full, complete, and in as creditable manner as possible, at the annual fairs and expositions, as mediums of advertising the products and resources of the State, and at the same time gratify and instruct the people.

While gross receipts have increased from year to year with the growth of all else indicative of prosperity and advancement, premiums and other provisions to accommodate exhibitors have been even more than correspondingly commensurate. Thus the balance on hand at the close of the first of the five years has been simply the stock in trade, as it were, and measurably kept intact.

It is safe to say that no other or kindred association in America has done so well and held five such consecutive and more successful expositions, given so general satisfaction in all respects, and attained so enviable a position to the front in fair work and results. In matters of dollars and cents, we close with $7,988.85 more than we commenced with.

When it is remembered that ninety-nine one-hundredths of the cash-paying patronage of a State Fair comes from within a radius of one hundred miles, and at the same time considering our population as compared with older states East, we can well conclude we are favored with a fair-going people who appreciate these great object-lesson schools, and readily become willing and attentive students.

With the largest total assets for the year 1889 over any other, and the balance less than last year, to be understood, needs this explanation: at the last fair we paid $1,901.46 more premiums than ever before, and $1,200 more for attractions than last year; besides, the expenditures for several other factors were naturally and materially increased.

Penuriousness is not economy. The world moves. We must keep up with the procession or get out of it. Much of Nebraska's valued reputation grows out of her enterprise. The individual, association, or people, who are content to run in the rut of lost ages, wear the cut and style garment of the aborigines or the Pilgrim Fathers; cut small grain with the ancient sickle or hoe, thresh it with the tramping equine hoof, and fan it out with nature's "wild winds," had better seek other climes than ours. There is not room for such in Nebraska's procession.

## WARRANTS ISSUED FOR THE YEAR 1889,

Showing date of issue, to whom, number, for what, and amount of each.

| DATE. | TO WHOM DRAWN. | NO. | FOR WHAT DRAWN. | AMT. | AMT. |
|---|---|---|---|---|---|
| Jan. 17 | J. S. Hughes | 1 | Services, Fair 1888 | | $35 00 |
| Jan. 17 | F. H. Young | 2 | Hotel bill | | 9 00 |
| Jan. 17 | S. L. Sperry | 3 | Hotel bill | | 3 00 |
| Jan. 17 | C. F. Way | 4 | Hotel bill | | 2 25 |
| Jan. 17 | J. B. McDowell | 5 | Hotel bill | | 3 00 |
| Jan. 17 | T. J. Cleaver | 6 | Hotel bill | | 3 00 |
| Jan. 17 | C. D. Shrader | 7 | Hotel bill | | 4 00 |
| Jan. 17 | W. E. Bishop | 8 | Assistant Superintendent—swine | | 15 00 |
| Jan. 17 | G. S. Kelley & Co | 9 | Scales | | 5 00 |
| Jan. 17 | A. Hayes | 10 | Janitor | | 4 00 |
| Jan. 17 | A. J. Leach | 11 | Hotel bill | | 7 00 |
| Jan. 17 | E. S. Gaylord | 12 | Hotel bill | | 5 50 |
| Jan. 17 | G. Ensign | 13 | Livery | | 7 00 |
| Jan. 17 | State Journal Co | 14 | Supplies | | 102 55 |
| Jan. 17 | R. W. Furnas | 15 | Clerk hire, 1888 | | 460 50 |
| Jan. 17 | A. W. Troyer | 16 | Superintendent Corn Show | | 10 00 |
| Jan. 18 | Windsor Hotel | 17 | Hotel bill—Winter meeting | | 220 90 |
| Jan. 18 | Capital Hotel | 18 | Hotel bill—Winter meeting | | 21 00 |
| Jan. 18 | M. A. Richards | 19 | Labor—Fair 1888 | | 2 00 |
| Jan. 19 | Geo. Sharr | 20 | Hotel bill | | 4 85 |
| Jan. 19 | Zehrung & Hinkle | 21 | Wire | | 1 05 |
| Jan. 19 | Mrs. M. J. Torence | 22 | Premium | $3 20 | |
| Jan. 19 | Edw. Blewett | 23 | Hotel bill | | 3 75 |
| Jan. 22 | Mat. Wacek | 24 | Corn premium, 1889 | 4 00 | |
| Jan. 22 | John Carter | 25 | Corn premium, 1889 | 2 40 | |
| Jan. 22 | James Dooley | 26 | Corn premium, 1889 | 4 00 | |
| Jan. 22 | H. Briggs | 27 | Corn premium, 1889 | 2 40 | |
| Jan. 22 | J. R. Ogilvie | 28 | Corn premium, 1889 | 4 00 | |
| Jan. 22 | Mat. Wacek | 29 | Corn premium, 1889 | 2 40 | |
| Jan. 22 | W. Westrope | 30 | Corn premium, 1889 | 4 00 | |
| Jan. 22 | W. S. Delano | 31 | Corn premium, 1889 | 4 00 | |
| Jan. 22 | H. Smith | 32 | Corn premium, 1889 | 2 40 | |
| Jan. 22 | W. C. Wellingford | 33 | Corn premium, 1889 | 4 00 | |
| Jan. 22 | John Carter | 34 | Corn premium, 1889 | 4 00 | |
| Jan. 22 | W. C. Wellingford | 35 | Corn premium, 1889 | 2 40 | |
| Jan. 22 | W. L. Troyer | 36 | Corn premium, 1889 | 4 00 | |
| Jan. 22 | J. L. H. Knight | 37 | Corn premium, 1889 | 2 40 | |
| Jan. 22 | J. Keatry | 38 | Corn premium, 1889 | 4 00 | |
| Jan. 22 | A. Bricker | 39 | Corn premium, 1889 | 4 00 | |
| Jan. 22 | Budd Jones | 40 | Corn premium, 1889 | 4 00 | |
| Jan. 22 | N. Baxter | 41 | Corn premium, 1889 | 2 40 | |
| Jan. 22 | Logan county | 42 | Corn premium, 1889 | 20 00 | |
| Jan. 22 | Red Willow county | 43 | Corn premium, 1889 | 12 00 | |
| Jan. 22 | N. Baxter | 44 | Corn premium, 1889 | 20 00 | |
| Jan. 22 | W. L. Troyer | 45 | Corn premium, 1889 | 12 00 | |
| Jan. 22 | H. S. Gunder | 46 | Arbor Day Prem., 1888 | 40 00 | |
| Jan. 22 | L. Kinsman | 47 | Hotel bill | | 5 75 |
| Jan. 22 | Lindell Hotel | 48 | Hotel bill | | 17 50 |
| Jan. 22 | L. Bruner | 49 | Botanist | | 25 00 |
| Jan. 30 | A. M. Troyer | 50 | Packing corn exhibit | | 12 30 |
| Feb. 1 | Mrs. J. T. Allen | 51 | Books—per order State Board | | 100 00 |
| Feb. 15 | W. H. Barstow | 52 | Speed expense | | 13 65 |
| Feb. 15 | F. A. Graham | 53 | Livery, Davis, 1887 | | 24 00 |
| Feb. 16 | W. J. Weeber | 54 | Letter copy books | | 25 25 |
| Feb. 18 | H. J. Hill | 55 | Advertising | | 25 00 |
| Feb. 18 | J. Burrows | 56 | Advertising | | 15 00 |
| Feb. 18 | R. T. Rainey | 57 | Postage, Jan. 1 to Feb. 11 | | 20 03 |
| Feb. 18 | R. W. Furnas | 58 | Expenses corn show | | 9 95 |
| Feb. 18 | C. E. Wiester | 59 | Ex., Frt., and Tel., Jan., 1889 | | 22 64 |
| Feb. 18 | C. E. Bessey | 60 | Ex. Corn Show | | 16 94 |
| Feb. 18 | Omaha Republican | 61 | Advertising | | 4 40 |
| Feb. 18 | Lincoln News | 62 | Advertising | | 5 20 |
| Feb. 18 | R. R. Greer | 63 | Ex.—School—Fair | | 5 77 |
| Feb. 21 | R. W. Furnas | 64 | First quarter salary | | 500 00 |
| Feb. 27 | Windsor Hotel | 65 | Hotel bill | | 46 75 |
| Feb. 27 | Transfer Co | 66 | Hauling | | 75 |
| Mch. 12 | Gibson, Miller & Richardson | 67 | Diplomas | | 45 00 |
| Mch. 13 | L. Bruner | 68 | Entry work | | 15 00 |
| Mch. 13 | C. E. Wiester | 69 | Ex., Tel., and Fgt., Feb., 1889 | | 21 00 |
| Mch. 27 | N. Dye | 70 | Premium, 1887 | 1 00 | |
| Apr. 6 | Sewell Clapp Co | 71 | Napkins | | 30 00 |
| Apr. 6 | Lincoln News Co | 72 | Advertising | | 4 00 |

### WARRANTS ISSUED FOR THE YEAR 1889 — CONTINUED.

| DATE. | TO WHOM DRAWN. | NO. | FOR WHAT DRAWN. | AMT. | AMT. |
|---|---|---|---|---|---|
| Apr. 6 | R. T. Rainey | 73 | Postage, February 11 to March 31 | | $10 06 |
| Apr. 6 | Cussons, May & Co | 74 | Blotters | | 10 00 |
| Apr. 6 | Brodix Pub. Co | 75 | Postal Guide | | 2 00 |
| Apr. 6 | C. E. Weister | 76 | Ex., Tel., and Fgt., March | | 18 92 |
| Apr. 6 | Bartholomew & Vallette | 77 | Dude eyes, adv | | 3 00 |
| Apr. 8 | B. C. Tappan | 78 | Premium, 1888 | $2 50 | |
| Apr. 26 | Sewell Clapp Co | 79 | Napkins | | 41 50 |
| Apr. 27 | Am. Trot. Ass'n | 80 | Dues and supplies | | 79 00 |
| May 1 | Strawbridge & Co | 81 | Speed cards | | 6 50 |
| May 6 | Gibson, Miller & Richardson | 82 | Speed Folders | | 35 00 |
| May 6 | C. E. Weister | 83 | Ex., Fgt., and Tel., April | | 41 84 |
| June 3 | R. W. Furnas | 84 | Second quarter salary | | 500 00 |
| June 3 | R. T. Rainey | 85 | Postage, April and May | | 78 43 |
| June 10 | R. W. Furnas | 86 | Tel., Cart., and books | | 22 00 |
| June 10 | C. E. Weister | 87 | Tel., Ex., and Fgt., May | | 43 15 |
| June 10 | R. W. Furnas | 88 | Rent | | 45 00 |
| June 10 | Sewell, Clapp Co | 89 | Match scratches | | 26 00 |
| June 10 | Paxton Hotel | 90 | Bill Bd. of Managers | | 15 00 |
| June 10 | Gast B. N. Co | 91 | Hangers | | 509 00 |
| June 10 | Nat. Ry. Pub. Co | 92 | Railway Guide, 1889 | | 5 00 |
| June 24 | Ezra A. Cook | 93 | Tickets | | 33 50 |
| June 26 | Courier Lith. Co | 94 | Lithograph bills | | 69 00 |
| July 1 | Russell & Morgan | 95 | Ostrich bills | | 28 75 |
| July 1 | R. T. Rainey | 96 | Postage, June | | 4 67 |
| July 6 | Sewell Clapp Co | 97 | Pocket books and tape lines | | 32 19 |
| July 15 | J. M. Jones | 98 | Mad. Mar. bills | | 15 00 |
| July 15 | C. E. Weister | 99 | Fgt. on small hangers | | 15 19 |
| July 15 | C. E. Weister | 100 | Ex., Fgt., Tel., June 1889 | | 47 12 |
| July 15 | R. W. Furnas | 101 | Extra service, Secretary's office | | 244 00 |
| July 15 | Fair Pub. Co | 102 | Tickets | | 59 53 |
| July 15 | Cussons, May & Co | 103 | 1,000 Mem. books | | 10 00 |
| July 15 | L. D. Woodruff | 104 | 500 Ostrich slips and 100,000 dodgers | | 54 50 |
| July 15 | Wolf & Co | 105 | 9,750 small hangers | | 390 00 |
| July 15 | R. R. Greer | 106 | Expenses to Kansas City | | 25 00 |
| July 15 | G. P. Rowell & Co | 107 | Newspaper Directory | | 5 00 |
| July 29 | Cin. Pap. Nov. Co | 108 | Envelopes | | 18 50 |
| Aug. 1 | McClay & Hall | 109 | Insurance | | 70 01 |
| Aug. 10 | Richmond & Co | 110 | 10,000 dog and cat cards | | 18 00 |
| Aug. 10 | Windsor Hotel | 111 | Board bill, Mch. 29 to Aug. 8 | | 103 20 |
| Aug. 10 | C. E. Weister | 112 | Fgt., Tel., and Ex., July, 1889 | | 43 08 |
| Aug. 10 | R. W. Furnas | 113 | Incidentals | | 16 75 |
| Aug. 10 | Lincoln News Co | 114 | Printing and advertising | | 26 35 |
| Aug. 10 | L. D. Woodruff | 115 | 50,000 folders | | 44 50 |
| Aug. 28 | R. W. Furnas | 116 | Third quarter salary | | 500 00 |
| Sept. 5 | G. W. Randall | 117 | Posting Adv. matter | | 36 00 |
| Sept. 6 | J. T. Mallalieu | 118 | Band | | 80 00 |
| Sept. 9 | Wm. Harvey | 119 | Labor on Fair Grounds | | 5 62 |
| Sept. 9 | W. D. Mann | 120 | Pay-roll, No. 1 | | 218 00 |
| Sept. 10 | H. G. Cutting | 121 | Clerk to President | | 66 50 |
| Sept. 10 | A. J. Arnold | 122 | Speed | 125 00 | |
| Sept. 10 | J. W. Zibbell | 123 | Speed | 50 00 | |
| Sept. 10 | B. E. Grant | 124 | Speed | 250 00 | |
| Sept. 10 | P. Y. Reynolds | 125 | Speed | 60 00 | |
| Sept. 11 | Sam Gorden | 126 | Speed | 25 00 | |
| Sept. 11 | W. H. Kennedy | 127 | Speed | 200 00 | |
| Sept. 11 | W. H. Kennedy | 128 | Speed | 50 00 | |
| Sept. 11 | M. J. Jones | 129 | Speed | 73 25 | |
| Sept. 11 | W. Z. Hickman | 130 | Expert—cattle | | 55 65 |
| Sept. 11 | E. P. Fuller | 131 | Speed | 219 75 | |
| Sept. 11 | A. A. Swearinger | 132 | Speed | 50 00 | |
| Sept. 11 | Ed. Pyle | 133 | Speed | 111 00 | |
| Sept. 12 | M. M. Edgar | 134 | Speed | 50 00 | |
| Sept. 12 | W. H. Harrison | 135 | Speed | 75 00 | |
| Sept. 12 | L. W. Parrotte | 136 | Speed | 250 00 | |
| Sept. 12 | R. Given | 137 | Speed | 125 00 | |
| Sept. 12 | Frank Pearson | 138 | Speed | 75 00 | |
| Sept. 12 | H. J. Hendyx | 139 | Expert—horses | | 12 65 |
| Sept. 12 | W. W. McClung | 140 | Expert—swine | | 91 10 |
| Sept. 12 | T. W. Trudesdale | 141 | Expert—swine | | 50 00 |
| Sept. 12 | J. W. Patterson | 142 | Expert—swine | | 38 60 |
| Sept. 12 | L. B. Wilson | 143 | Premiums | 40 00 | |
| Sept. 12 | C. H. Elmendorf | 144 | Premiums | 304 00 | |

WARRANTS ISSUED FOR THE YEAR 1889—CONTINUED.

| DATE. | TO WHOM DRAWN. | NO. | FOR WHAT DRAWN. | AMT. | AMT. |
|---|---|---|---|---|---|
| Sept. 12 | C. D. Ives | 145 | Speed | $150 00 | |
| Sept. 12 | A. W. Denison | 146 | Speed | 450 00 | |
| Sept. 12 | E. A. Hugnes | 147 | Speed | 100 00 | |
| Sept. 12 | G. D. Hoy | 148 | Speed | 375 00 | |
| Sept. 11 | Wescott, Gibbon & Co. | 149 | Speed | 125 00 | |
| Sept. 11 | H. E. Morrison | 150 | Speed | 75 00 | |
| Sept. 11 | G. E. Birge | 151 | Speed | 250 00 | |
| Sept. 11 | G. B. Goodel | 152 | Speed | 250 00 | |
| Sept. 11 | Perry Brothers | 153 | Speed | 100 00 | |
| Sept. 11 | Perry Brothers | 154 | Speed | 25 00 | |
| Sept. 11 | J. P. Laudeman | 155 | Speed | 500 00 | |
| Sept. 11 | T. Walter | 156 | Speed | 37 50 | |
| Sept. 12 | H. Perkins | 157 | Speed | 100 00 | |
| Sept. 12 | H. Perkins | 158 | Speed | 15 00 | |
| Sept. 12 | Geo. Lee | 159 | Speed | 50 00 | |
| Sept. 12 | W. D. Barnes | 160 | Speed | 15 00 | |
| Sept. 12 | S. N. Wright | 161 | Expert—cattle | | $97 70 |
| Sept. 12 | W. A. Harris | 162 | Expert—cattle | | 59 00 |
| Sept. 13 | Alex Legge | 163 | Expert—cattle | | 43 00 |
| Sept. 13 | J. Evans & Son | 164 | Premiums | 96 00 | |
| Sept. 13 | W. H. Ramsey | 165 | Speed | 22 50 | |
| Sept. 13 | E. Kretchmer | 166 | Premiums | 41 00 | |
| Sept. 13 | C. H. Searles | 167 | Premiums | 50 40 | |
| Sept. 13 | Howard Bros | 168 | Premiums | 96 00 | |
| Sept. 13 | J. Browder | 169 | Premiums | 32 80 | |
| Sept. 13 | A. H. Cramer | 170 | Speed | 50 00 | |
| Sept. 13 | P. J. Gossard | 171 | Premiums | 4 00 | |
| Sept. 13 | B. O. Cowan | 172 | Premiums | 92 00 | |
| Sept. 13 | S. H. Webster | 173 | Service as Superintendent | | 50 00 |
| Sept. 13 | L. B. Wilson | 174 | Premiums | 84 00 | |
| Sept. 13 | C. C. Wright | 175 | Premiums | 20 00 | |
| Sept. 13 | John Batie | 176 | Premiums | 16 00 | |
| Sept. 13 | Custer county | 177 | Premiums | 240 00 | |
| Sept. 13 | Thayer county | 178 | Premiums | 160 00 | |
| Sept. 13 | Altem Bros | 179 | Premiums | 80 00 | |
| Sept. 13 | P. Hopley | 180 | Premiums | 108 00 | |
| Sept. 13 | B. F. Berkey | 181 | Premiums | 10 90 | |
| Sept. 13 | T. B. Rankin | 182 | Premiums | 4 00 | |
| Sept. 13 | E. Bennett & Son | 183 | Premiums | 16 00 | |
| Sept. 13 | Joseph Watson & Co. | 184 | Premiums | 20 00 | |
| Sept. 13 | A. Banlow | 185 | Premiums | 20 00 | |
| Sept. 13 | M. Doolittle | 186 | Class Superintendent | | 62 00 |
| Sept. 13 | W. H. Jordon | 187 | Expert—horses | | 10 00 |
| Sept. 13 | John Hasseldon | 188 | Expert—horses | | 35 00 |
| Sept. 13 | Williams & Householder | 189 | Premiums | 436 00 | |
| Sept. 13 | S. T. James | 190 | Premiums | 8 00 | |
| Sept. 13 | D. W. Brittan | 191 | Expert | | 26 00 |
| Sept. 13 | Berg & Story | 192 | Premiums | 16 00 | |
| Sept. 13 | W. W. Seeley | 193 | Premiums | 36 00 | |
| Sept. 13 | T. J. Harris | 194 | Premiums | 12 00 | |
| Sept. 13 | U. P. Bennett & Son | 195 | Premiums | 78 40 | |
| Sept. 13 | H. McClannahan | 196 | Premiums | 19 20 | |
| Sept. 13 | J. Barr & Son | 197 | Premiums | 16 00 | |
| Sept. 13 | J. S. Kirkpatrick | 198 | Premiums | 4 00 | |
| Sept. 13 | Vanderslice Bros | 199 | Premiums | 12 00 | |
| Sept. 13 | J. D. Moore | 200 | Premiums | 16 00 | |
| Sept. 13 | Kesterson & Tolleth | 201 | Speed | 34 00 | |
| Sept. 13 | Kesterson & Tolleth | 202 | Speed | 3 00 | |
| Sept. 13 | Ed. Pyle | 203 | Speed | 25 00 | |
| Sept. 13 | Ed. Pyle | 204 | Speed | 12 50 | |
| Sept. 13 | J. W. Zibble | 205 | Speed | 25 00 | |
| Sept. 13 | Frank Pearson | 206 | Speed | 125 00 | |
| Sept. 13 | A. J. Arnold | 207 | Speed | 62 50 | |
| Sept. 13 | L. U. Parsons | 208 | Premiums | 11 30 | |
| Sept. 13 | Cuming county | 209 | Premiums | 128 00 | |
| Sept. 13 | H. C. Stoll | 210 | Premiums | 148 00 | |
| Sept. 13 | H. A. Stoll | 211 | Premiums | 118 40 | |
| Sept. 13 | O. Compton | 212 | Premiums | 16 00 | |
| Sept. 13 | E. Trinder & Co | 213 | Premiums | 32 00 | |
| Sept. 13 | J. S. Barber | 214 | Premiums | 16 00 | |
| Sept. 13 | John Virgin | 215 | Premiums | 120 00 | |
| Sept. 13 | W. McTurk | 216 | Premiums | 98 00 | |
| Sept. 13 | L. A. Kent | 217 | Pay-roll | | 330 00 |

### WARRANTS ISSUED FOR THE YEAR 1889 — CONTINUED.

| DATE. | TO WHOM DRAWN. | NO. | FOR WHAT DRAWN. | AMT. | AMT. |
|---|---|---|---|---|---|
| Sept. 13 | Havens Stock Farm | 218 | Premiums | $16 00 | |
| Sept. 13 | E. A. Wescott | 219 | Premiums | 7 20 | |
| Sept. 13 | Sexton, Warren & Offord | 220 | Premiums | 130 00 | |
| Sept. 13 | Holderbaum Bros | 221 | Premiums | 122 40 | |
| Sept. 13 | Frank H. Huffman | 222 | Ostriches | | $500 00 |
| Sept. 13 | Samuel Jewett | 223 | Premiums | 52 00 | |
| Sept. 13 | G. R. Russam | 224 | Premiums | 4 00 | |
| Sept. 13 | W. H. Cramer | 225 | Premiums | 2 00 | |
| Sept. 13 | E. E. Day | 226 | Premiums | 48 00 | |
| Sept. 13 | George B. French | 227 | Premiums | 8 00 | |
| Sept. 13 | E. F. Latta | 228 | Premiums | 35 00 | |
| Sept. 13 | Makin Bros | 229 | Premiums | 104 00 | |
| Sept. 13 | J. P. Wagner | 230 | Premiums | 16 00 | |
| Sept. 13 | C. C. Stout | 231 | Premiums | 8 00 | |
| Sept. 13 | Home Farm Co | 232 | Premiums | 208 00 | |
| Sept. 13 | C. F. Best | 233 | Premiums | 8 00 | |
| Sept. 13 | J. L. Locke | 234 | Premiums | 16 00 | |
| Sept. 13 | L. Clay | 235 | Premiums | 12 00 | |
| Sept. 13 | G. W. Merritt | 236 | Premiums | 16 00 | |
| Sept. 13 | D. H. Harris | 237 | Madame Marantette | | 700 00 |
| Sept. 13 | Chas. H. Clevenger | 238 | Premiums | 4 00 | |
| Sept. 13 | W. E. Spicer | 239 | Premiums | 54 40 | |
| Sept. 13 | Williams & Chapman, | 240 | Premiums | 162 00 | |
| Sept. 13 | Emerson Seed Co | 241 | Premiums | 38 40 | |
| Sept. 13 | Alex. Sloan | 242 | Premiums | 8 00 | |
| Sept. 13 | George Richardson | 243 | Premiums | 40 00 | |
| Sept. 13 | George Richardson | 244 | Premiums | 4 00 | |
| Sept. 13 | E. D. King | 245 | Premiums | 44 80 | |
| Sept. 13 | W. J. Hesser | 246 | Premiums | 4 40 | |
| Sept. 13 | E. C. Millar | 247 | Premiums | 96 00 | |
| Sept. 13 | A. Greenamyer | 248 | Premiums | 18 40 | |
| Sept. 13 | Isaac Holt | 249 | Premiums | 1 00 | |
| Sept. 13 | Crowe & Bellows | 250 | Premiums | 4 00 | |
| Sept. 13 | J. L. Barton | 251 | Premiums | 28 00 | |
| Sept. 13 | O. O. Hefner | 252 | Premiums | 52 00 | |
| Sept. 13 | O. S. Woolcott | 253 | Premiums | 24 00 | |
| Sept. 13 | James Dyche | 254 | Premiums | 16 00 | |
| Sept. 13 | M. E. Moore | 255 | Premiums | 132 00 | |
| Sept. 13 | W. E. Spicer | 256 | Premiums | 20 00 | |
| Sept. 13 | Judd Bros | 257 | Premiums | 96 00 | |
| Sept. 13 | N. H. Gentry | 258 | Premiums | 66 40 | |
| Sept. 13 | Mrs. Wm. Gardner | 259 | Premiums | 1 00 | |
| Sept. 13 | J. P. Antill | 260 | Premiums | 2 40 | |
| Sept. 13 | C. L. Brainard | 261 | Premiums | 12 80 | |
| Sept. 13 | M. E. McHenry | 262 | Speed | 75 00 | |
| Sept. 13 | O. W. Kinney | 263 | Speed | 144 00 | |
| Sept. 13 | C. W. Kinney | 264 | Speed | 56 00 | |
| Sept. 13 | Wm. Ramsey | 265 | Speed | 125 00 | |
| Sept. 13 | J. W. Hiles | 266 | Speed | 75 00 | |
| Sept. 13 | A. A. Swearenger | 267 | Speed | 450 00 | |
| Sept. 13 | A. A. Swearenger | 268 | Speed | 50 00 | |
| Sept. 13 | Ed. Pyle | 269 | Speed | 82 50 | |
| Sept. 13 | R. H. Stewart | 270 | Ice | | 18 00 |
| Sept. 13 | H. Perkins | 271 | Speed | 25 00 | |
| Sept. 13 | John S. Hughes | 272 | Labor | | 35 00 |
| Sept. 13 | G. C. Smith | 273 | Speed | 247 50 | |
| Sept. 14 | John Gosling | 274 | Expert—cattle | | 106 00 |
| Sept. 14 | W. W. Watson | 275 | Clerk | | 40 00 |
| Sept. 14 | C. H. Barnard | 276 | Clerk | | 35 00 |
| Sept. 14 | G. F. Warren | 277 | Clerk | | 35 00 |
| Sept. 14 | A. K. Marsh | 278 | Pay-roll, police | | 300 00 |
| Sept. 14 | C. K. Lawson | 279 | Class Superintendent | | 40 00 |
| Sept. 14 | John Doolittle | 280 | Class Superintendent | | 40 00 |
| Sept. 14 | John Holliday | 281 | Posting advertising | | 45 00 |
| Sept. 14 | Harvey Orton | 282 | Labor | | 1 65 |
| Sept. 14 | W. Parks | 283 | Labor | | 65 |
| Sept. 14 | J. W. McDermot | 284 | Judge | | 5 00 |
| Sept. 14 | M. M. Milleman | 285 | Clerk | | 6 00 |
| Sept. 14 | J. Jensen | 286 | Superintendent | | 25 00 |
| Sept. 14 | Wm. Dunlap | 287 | Superintendent | | 45 00 |
| Sept. 14 | George B. Skinner | 288 | Horse hire | | 6 00 |
| Sept. 14 | H. Fry | 289 | Judge—speed | | 25 00 |
| Sept. 14 | Frank Rawlings | 290 | Horse hire | | 6 00 |

WARRANTS ISSUED FOR THE YEAR 1889—CONTINUED.

| DATE. | TO WHOM DRAWN. | NO. | FOR WHAT DRAWN. | AMT. | AMT. |
|---|---|---|---|---|---|
| Sept. 14 | W. L. Dawson | 291 | Clerk |  | $9 00 |
| Sept. 14 | A. Humphrey | 292 | Labor |  | 189 60 |
| Sept. 14 | R. R. Greer | 293 | Secret police |  | 42 00 |
| Sept. 14 | C. I. Tuttle | 294 | Speed ring |  | 45 60 |
| Sept. 14 | B. H. Dunn | 295 | Class Superintendent |  | 57 00 |
| Sept. 14 | Alex Stephens | 296 | Class Superintendent |  | 45 20 |
| Sept. 14 | Mrs. S. C. Langworthy, | 297 | Class Superintendent |  | 50 00 |
| Sept. 14 | Mrs. J. Persoll | 298 | Class Superintendent |  | 45 00 |
| Sept. 14 | J. A. Alley | 299 | Labor |  | 27 00 |
| Sept. 14 | J. R. Megehan | 300 | Poultry |  | 148 53 |
| Sept. 14 | E. A. Park | 301 | Assistant Superintendent Art Hall |  | 16 00 |
| Sept. 14 | F. S. Fulmer | 302 | Tickets |  | 4 58 |
| Sept. 14 | J. Jensen | 303 | Sundries |  | 7 40 |
| Sept. 14 | W. R. Bowen | 304 | Gate keepers |  | 269 75 |
| Sept. 14 | S. C. Bassett | 305 | Tickets |  | 5 33 |
| Sept. 14 | Wm. Sutton | 306 | Transportation |  | 2 40 |
| Sept. 14 | W. D. Wildman | 307 | Labor and expense |  | 39 20 |
| Sept. 14 | S. J. Bateman | 308 | Labor |  | 16 00 |
| Sept. 14 | Chas. Maun | 309 | Premium | $7 80 |  |
| Sept. 14 |  | 310 |  |  |  |
| Sept. 14 | Ed. Pyle | 311 | Premium | 222 40 |  |
| Sept. 14 | W. S. Tough | 312 | Starter |  | 200 00 |
| Sept. 14 | H. Pickerell | 313 | Speed | 25 00 |  |
| Sept. 14 | A. Palmer | 314 | Premiums | 8 00 |  |
| Sept. 14 | R. Conway | 315 | Premiums | 12 00 |  |
| Sept. 14 | C. W. Burkett | 316 | Premiums | 1 00 |  |
| Sept. 14 | B. G. Fenner | 317 | Premiums | 36 30 |  |
| Sept. 14 | E. M. McGillin | 318 | Premiums | 16 00 |  |
| Sept. 14 | Mrs. V. H. Dyer | 319 | Premiums | 3 00 |  |
| Sept. 14 | Mrs. J. H. Alford | 320 | Premiums | 9 20 |  |
| Sept. 14 | J. L. Millar | 321 | Premiums | 8 00 |  |
| Sept. 14 | Maggie Johnson | 322 | Premiums | 1 00 |  |
| Sept. 14 | Mrs. A. B. Baker | 323 | Premiums | 21 10 |  |
| Sept. 14 | L. E. Mahan | 324 | Premiums | 60 80 |  |
| Sept. 14 | Mrs. E. J. Fleming | 325 | Premiums | 6 20 |  |
| Sept. 14 | J. W. Cushman | 326 | Premiums | 2 00 |  |
| Sept. 14 | J. A. Rose | 327 | Premiums | 8 40 |  |
| Sept. 14 | S. L. Roberts | 328 | Class Superintendent |  | 50 00 |
| Sept. 14 | M. L. Trester | 329 | Class Superintendent |  | 50 00 |
| Sept. 14 | E. W. Whitcomb | 330 | Class Superintendent |  | 40 00 |
| Sept. 14 | S. C. Bassett | 331 | Class Superintendent |  | 40 00 |
| Sept. 14 | A. J. Leach | 332 | Class Superintendent |  | 45 00 |
| Sept. 14 | Sarah M. Moore | 333 | Expert |  | 8 00 |
| Sept. 14 | W. R. Bowen | 334 | Superintendent |  | 50 00 |
| Sept. 14 | G. F. Dickman | 335 | Clerk—speed |  | 75 75 |
| Sept. 14 | J. H. Steen | 336 | Horse hire |  | 7 50 |
| Sept. 14 | A. K. Marsh | 337 | Expenses |  | 18 00 |
| Sept. 14 | Christian Church | 338 | Meals for band |  | 49 80 |
| Sept. 14 | W. D. Mann | 339 | Pay-roll No. 2 |  | 206 70 |
| Sept. 14 | H. Honeywell | 340 | Messenger and clerk |  | 19 50 |
| Sept. 14 | R. M. Turner | 341 | Forage |  | 9 20 |
| Sept. 14 | G. S. Fulmer | 342 | Com. service |  | 25 00 |
| Sept. 14 | L. T. Brown & Bro | 343 | Forage |  | 36 75 |
| Sept. 14 | Wm. Sutton | 344 | Labor |  | 25 00 |
| Sept. 14 | J. A. Bailey | 345 | White-washing |  | 49 56 |
| Sept. 14 | A. Humphrey | 246 | Pay-roll |  | 158 20 |
| Sept. 14 | F. E. Newton | 347 | Clerk hire |  | 6 00 |
| Sept. 14 | D. G. Courtney | 348 | Superintendent |  | 2 00 |
| Sept. 14 | M. L. Trester | 349 | Lumber |  | 336 65 |
| Sept. 14 | O. M. Druse | 350 | Master—transportation |  | 100 00 |
| Sept. 14 | The Gotham | 351 | Supplies—Art Hall |  | 4 93 |
| Sept. 14 | Emma Gillespie | 352 | Clerk |  | 39 00 |
| Sept. 14 | Geo. G. Furnas | 353 | Clerk |  | 96 00 |
| Sept. 14 | Tom Cook | 354 | Clerk |  | 18 00 |
| Sept. 14 | R. W. Furnas | 355 | Express, freight, and telegraph |  | 23 90 |
| Sept. 14 | J. M. Lee | 356 | Class Superintendent |  | 25 00 |
| Sept. 14 | L. A. Kent | 357 | Salary—1889 |  | 250 00 |
| Sept. 14 | Hutchins & Hyatt | 358 | Sawdust |  | 47 25 |
| Sept. 14 | Lincoln Ice Co | 359 | Ice |  | 112 94 |
| Sept. 14 | S. M. Barker | 360 | Booth—per cent |  | 423 06 |
| Sept. 14 | State Univ. Band | 361 | Band |  | 135 00 |
| Sept. 14 | A. K. Marsh | 362 | Pay-roll |  | 458 55 |
| Sept. 14 | J. T. Mallalieu | 363 | Band |  | 110 30 |
| Sept. 14 | E. E. Gillespie | 364 | Pay-roll, Art Hall |  | 92 00 |

WARRANTS ISSUED FOR THE YEAR 1889 — CONTINUED.

| DATE. | TO WHOM DRAWN. | NO. | FOR WHAT DRAWN. | AMT. | AMT. |
|---|---|---|---|---|---|
| Sept. 14 | A. K. Marsh | 365 | Police Pay-roll |  | $13 50 |
| Sept. 14 | L. A. Kent | 366 | Incidental expenses |  | 27 35 |
| Sept. 14 | State Journal Co. | 367 | Printing |  | 15 00 |
| Sept. 14 | F. B. Fargo & Co. | 368 | Dairy supplies |  | 17 55 |
| Sept. 14 | C. C. Pace | 369 | Posting advertising |  | 24 50 |
| Sept. 14 | McMullin Wire Co. | 370 | Wire for ostrich fence |  | 30 58 |
| Sept. 14 | Thos. Mulvahill | 371 | Posting bills |  | 96 55 |
| Sept. 14 | Dunton's Spirit of T. | 372 | Advertising |  | 25 00 |
| Sept. 14 | J. H. McShane | 373 | One-third advertising speed |  | 72 67 |
| Sept. 14 | H. R. Nissley | 374 | Supplies Art Hall |  | 39 26 |
| Sept. 14 | Carter, Rice & Co. | 375 | Printing |  | 2 50 |
| Sept. 14 | W. Schuck | 376 | Labor |  | 3 12 |
| Sept. 14 | R. T. Rainey | 377 | Postage, August, 1889 |  | 65 56 |
| Sept. 14 | E. J. Hall | 378 | Advertising |  | 4 95 |
| Sept. 14 | W. U. Telegraph Co. | 379 | Telegraphing |  | 8 33 |
| Sept. 14 | Omaha Republican | 380 | Advertising |  | 8 40 |
| Sept. 14 | A. Humphrey | 381 | General Superintendent |  | 100 00 |
| Sept. 14 | A. S. Godfrey | 382 | Lumber |  | 352 72 |
| Sept. 14 | J. B. Dinsmore | 383 | Expenses to Des Moines |  | 20 00 |
| Sept. 14 | Scarff & Cole | 384 | Advertising |  | 6 80 |
| Sept. 14 | Merritt & Stretch | 385 | Advertising |  | 4 05 |
| Sept. 14 | B. H. Henry | 386 | Salary |  | 250 00 |
| Sept. 14 | E. A. Barnes | 387 | Salary |  | 187 50 |
| Sept. 14 | J. B. Dinsmore | 388 | Salary |  | 187 50 |
| Sept. 14 | J. B. Dinsmore | 389 | Superintendent |  | 40 00 |
| Sept. 14 | E. McIntyre | 390 | Salary |  | 187 50 |
| Sept. 14 | M. Dunham | 391 | Salary |  | 187 50 |
| Sept. 14 | M. Dunham | 392 | Expenses |  | 5 10 |
| Sept. 14 | E. N. Grennell | 393 | Superintendent Art Hall |  | 80 00 |
| Sept. 14 | C. Hungate | 394 | Clerk to board |  | 30 00 |
| Sept. 14 | E. N. Grennell | 395 | On road advertising |  | 35 00 |
| Sept. 14 | Lincoln News | 396 | Printing |  | 23 70 |
| Sept. 14 | W. G. Bohanan | 397 | Livery |  | 12 00 |
| Sept. 14 | L. D. Woodruff | 398 | Printing |  | 48 50 |
| Sept. 14 | Express Pub. Co. | 399 | Advertising |  | 2 90 |
| Sept. 14 | Morris Printing Co. | 400 | Swine score card |  | 7 00 |
| Sept. 14 | Mrs. E. Stewart | 401 | Premiums | $2 00 |  |
| Sept. 14 | M. R. Stanley | 402 | Premiums | 8 00 |  |
| Sept. 14 | Mrs. M. Scott | 403 | Premiums | 2 00 |  |
| Sept. 14 | Mrs. J. W. Bell | 404 | Premiums | 2 00 |  |
| Sept. 14 | E. E. Smith | 405 | Premiums | 10 00 |  |
| Sept. 14 | H. H. Bagg | 406 | Premiums | 14 00 |  |
| Sept. 14 | C. T. Brown | 407 | Premiums | 6 00 |  |
| Sept. 14 | Mrs. A. M. Blair | 408 | Premiums | 21 00 |  |
| Sept. 14 | J. G. Duling | 409 | Premiums | 2 40 |  |
| Sept. 14 | H. C. Smith | 410 | Speed | 75 00 |  |
| Sept. 14 | J. H. Alford | 411 | Premiums | 3 20 |  |
| Sept. 14 | May Newton | 412 | Premiums | 2 00 |  |
| Sept. 14 | [illegible]. L. Hooper | 413 | Premiums | 3 00 |  |
| Sept. 14 | W. M. Clark | 414 | Premiums | 68 00 |  |
| Sept. 14 | Mrs. M. T. Hawkins | 415 | Premiums | 2 00 |  |
| Sept. 14 | Marsh & Close | 416 | Premiums | 72 00 |  |
| Sept. 14 | Milliken Bros. | 417 | Premiums | 16 00 |  |
| Sept. 14 | E. L. Trester | 418 | Premiums | 4 00 |  |
| Sept. 14 | Blanche Garten | 419 | Premiums | 4 00 |  |
| Sept. 14 | Nellie Gallup | 420 | Premiums | 5 20 |  |
| Sept. 14 | Nellie Odell | 421 | Premiums | 3 00 |  |
| Sept. 14 | Minnie U. Burk | 422 | Premiums | 7 50 |  |
| Sept. 14 | Blonda Ohrstrom | 423 | Premiums | 4 00 |  |
| Sept. 14 | Bettie Barr | 424 | Premiums | 2 00 |  |
| Sept. 14 | Bettie Barr | 425 | Premiums | 2 00 |  |
| Sept. 14 | A. Friend | 426 | Premiums | 2 00 |  |
| Sept. 14 | Blanche Lamb | 427 | Premiums | 4 00 |  |
| Sept. 14 | George Arkwright | 428 | Mounting Corn |  | 42 32 |
| Sept. 14 | Neb. Telegraph Co. | 429 | Services at Fair |  | 40 30 |
| Sept. 14 | A. S. Mercer | 430 | Advertising |  | 10 00 |
| Sept. 14 | Blodgett & Ladwig | 431 | Aquariums |  | 234 00 |
| Sept. 14 | M. F. Smith | 432 | Corn hangers |  | 9 75 |
| Sept. 14 | C. E. Weister | 433 | Tel., Ex., and Fgt., Aug. |  | 48 48 |
| Sept. 14 | R. R. Greer | 434 | Salary |  | 200 00 |
| Sept. 14 | E. P. Childs | 435 | Superintendent |  | 27 00 |
| Sept. 18 | Saunders Co. | 436 | Premiums | 175 00 |  |
| Sept. 18 | Saunders Co. | 437 | Premiums | 25 00 |  |
| Sept. 20 | G. H. Batdorf | 438 | Premiums | 15 20 |  |

WARRANTS ISSUED FOR THE YEAR 1889 — CONTINUED.

| DATE. | TO WHOM DRAWN. | NO. | FOR WHAT DRAWN. | AMT. | AMT. |
|---|---|---|---|---|---|
| Sept. 20 | J. H. Gardner | 439 | Premiums | $11 80 | |
| Sept. 20 | J. H. Steiner | 440 | Fines and collections on track | | $149 62 |
| Sept. 20 | T. O. Moon & Son | 441 | Premiums | 16 00 | |
| Sept. 20 | Wm. Rotton | 442 | Premiums | 13 20 | |
| Sept. 20 | S. J. & H. Carpenter | 443 | Premiums | 28 40 | |
| Sept. 20 | S. S. Borton | 444 | Premiums | 61 20 | |
| Sept. 20 | P. J. Osterman | 445 | Premiums | 54 40 | |
| Sept. 20 | Thos. Dobson | 446 | Premiums | 40 00 | |
| Sept. 20 | D. C. Clapp | 447 | Premiums | 32 80 | |
| Sept. 20 | L. P. Harris | 448 | Premiums | 15 60 | |
| Sept. 20 | Wm. Roberts | 449 | Premiums | 21 60 | |
| Sept. 20 | J. A. McNabb | 450 | Premiums | 13 60 | |
| Sept. 20 | Geo. Correvan | 451 | Premiums | 115 70 | |
| Sept. 20 | Albert Lemon | 452 | Premiums | 6 00 | |
| Sept. 20 | G. E. Goodrich | 453 | Premiums | 2 00 | |
| Sept. 20 | W. N. Rehlaender | 454 | Premiums | 4 80 | |
| Sept. 20 | W. C. Durland | 455 | Premiums | 2 40 | |
| Sept. 20 | Smith Bros | 456 | Premiums | 3 00 | |
| Sept. 20 | F. G. Kauffman | 457 | Premiums | 2 00 | |
| Sept. 20 | A. F. Heartwell | 458 | Premiums | 24 80 | |
| Sept. 20 | H. H. Harley | 459 | Premiums | 2 00 | |
| Sept. 20 | J. W. Jones | 460 | Premiums | 4 80 | |
| Sept. 20 | E. C. Hills | 461 | Premiums | 2 40 | |
| Sept. 20 | Grant Hoagland | 462 | Premiums | 2 40 | |
| Sept. 20 | John Baldwin | 463 | Premiums | 2 40 | |
| Sept. 20 | L. C. Wren | 464 | Premiums | 10 40 | |
| Sept. 20 | I. L. Lyman | 465 | Premiums | 15 20 | |
| Sept. 20 | H. W. Hewitt | 466 | Premiums | 6 40 | |
| Sept. 20 | Lillie M. Gillespie | 467 | Premiums | 5 00 | |
| Sept. 21 | A. G. Porter | 468 | Premiums | 24 40 | |
| Sept. 21 | M. M. Coad | 469 | Premiums | 326 40 | |
| Sept. 21 | E. F. Black | 470 | Premiums | 26 40 | |
| Sept. 21 | Imp. Draft Horse Co | 471 | Premiums | 92 00 | |
| Sept. 21 | S. M. Melick | 472 | Premiums | 8 00 | |
| Sept. 21 | Wm. Demaree | 473 | Premiums | 8 00 | |
| Sept. 21 | Wm. Harrison | 474 | Premiums | 8 00 | |
| Sept. 21 | John A. Purbaugh | 475 | Premiums | 3 20 | |
| Sept. 21 | N. P. Jensen | 476 | Premiums | 20 00 | |
| Sept. 21 | F. G. Kauffman | 477 | Premiums | 8 00 | |
| Sept. 21 | E. C. Hill | 478 | Premiums | 68 00 | |
| Sept. 21 | I. M. Raymond | 479 | Premiums | 4 00 | |
| Sept. 21 | D. T. Hill | 480 | Premiums | 8 00 | |
| Sept. 21 | H. F. Cummins | 481 | Premiums | 8 00 | |
| Sept. 21 | C. H. Ballinger | 482 | Premiums | 110 40 | |
| Sept. 21 | A. J. Richardson | 483 | Premiums | 34 40 | |
| Sept. 21 | T. W. Harvey | 484 | Premiums | 114 40 | |
| Sept. 21 | John O'Connel | 485 | Premiums | 8 00 | |
| Sept. 21 | Dawson Bros | 486 | Premiums | 4 00 | |
| Sept. 21 | S. E. Shellenberger | 487 | Premiums | 28 80 | |
| Sept. 21 | W. H. Gilmore | 488 | Premiums | 4 00 | |
| Sept. 21 | S. E. Morton | 489 | Premiums | 46 40 | |
| Sept. 21 | J. R. Lownes | 490 | Premiums | 16 00 | |
| Sept. 21 | Table Rock Creamery, | 491 | Premiums | 18 80 | |
| Sept. 21 | West Point Creamery | 492 | Premiums | 10 00 | |
| Sept. 21 | Aurora Creamery | 493 | Premiums | 24 80 | |
| Sept. 21 | Mrs. A. Roberts | 494 | Premiums | 4 00 | |
| Sept. 21 | Mrs. W. M. Clark | 495 | Premiums | 3 00 | |
| Sept. 21 | Mrs. G. W. Jenkins | 496 | Premiums | 1 00 | |
| Sept. 21 | Mrs. J. N. Heater | 497 | Premiums | 30 00 | |
| Sept. 21 | F. S. Fulmer | 498 | Premiums | 8 00 | |
| Sept. 21 | John Welch | 499 | Premiums | 8 00 | |
| Sept. 21 | T. M. Sexton | 500 | Premiums | 12 00 | |
| Sept. 21 | Sallie Furnas | 501 | Premiums | 6 00 | |
| Sept. 21 | Mrs. Lancton | 502 | Premiums | 2 50 | |
| Sept. 21 | Mrs. Agey | 503 | Premiums | 7 50 | |
| Sept. 24 | Oliver Maggard | 504 | Hauling | | 24 00 |
| Sept. 24 | Humphrey Bros | 505 | Hardware | | 194 47 |
| Sept. 24 | State Journal Co | 506 | Printing and supplies | | 2091 21 |
| Sept. 24 | W. D. Mann | 507 | Pay-roll—labor | | 152 50 |
| Sept. 24 | B. Terwilligeon | 508 | Sprinkling | | 24 00 |
| Sept. 24 | R. E. Dingee | 509 | Sprinkling | | 25 00 |
| Sept. 24 | Merchants' Transfer | 510 | Cartage | | 8 50 |
| Sept. 24 | Lincoln News Co | 511 | Advertising | | 40 00 |
| Sept. 24 | Daily Call | 512 | Advertising | | 60 00 |

### WARRANTS ISSUED FOR THE YEAR 1889 — CONTINUED.

| DATE. | TO WHOM DRAWN. | NO. | FOR WHAT DRAWN. | AMT. | AMT. |
|---|---|---|---|---|---|
| Sept. 24 | O. M. Druse | 513 | Advertising | | $17 75 |
| Sept. 24 | Transfer Co | 514 | Carting | | 1 50 |
| Sept. 24 | H. Herpolsheimer | 515 | Art Hall supplies | | 23 45 |
| Sept. 24 | W. J. Cooper & C Bros. | 516 | Gas pipe | | 23 40 |
| Sept. 24 | Windsor Hotel | 517 | Board bill | | 242 15 |
| Sept. 24 | R. H. Oakley | 518 | Coal | | 30 83 |
| Sept. 27 | J. H. McShane | 519 | Speed | $125 00 | |
| Sept. 27 | Louisa Bauer | 520 | Expert—Art Hall | | 25 00 |
| Sept. 27 | F. Graham | 521 | Livery | | 12 00 |
| Sept. 27 | J. C. Warner | 522 | Exp. Des Moines, and posting adv | | 37 25 |
| Sept. 27 | S. J. Odell | 523 | Speed | 64 00 | |
| Sept. 27 | Frank Pearson | 524 | Fine, speed—remitted | | 15 00 |
| Sept. 28 | S. E. Moore | 525 | Glass for fair | | 12 75 |
| Sept. 28 | Paxton Hotel | 526 | Board bill | | 34 70 |
| Sept. 28 | B. & M. R. R. | 527 | Switching cars | | 100 00 |
| Sept. 28 | Ed. Brown | 528 | Engineer Power Hall | | 46 00 |
| Sept. 28 | J. H. Harley | 529 | Oil | | 6 75 |
| Sept. 28 | Gran. Ensign | 530 | Livery | | 12 75 |
| Sept. 28 | Baldwin Bros. | 531 | Ticket boxes | | 18 00 |
| Sept. 28 | W. A. Judkins | 532 | Repairs, Secretary's office | | 6 00 |
| Sept. 28 | Frank H. Young | 533 | Superintendent amphitheater | | 25 00 |
| Sept. 28 | Douglas Co. Agr. So | 534 | Premiums | 80 00 | |
| Sept. 28 | Mrs. S. C. Bassett | 535 | Premiums | 18 00 | |
| Sept. 28 | Nellie Rosewater | 536 | Premiums | 3 00 | |
| Sept. 28 | Alice Tynes | 537 | Premiums | 2 00 | |
| Sept. 28 | C. F. Hall | 538 | Premiums | 8 80 | |
| Sept. 28 | A. D. King | 539 | Premiums | 2 40 | |
| Sept. 28 | F. J. Rogers | 540 | Premiums | 2 40 | |
| Sept. 28 | A. F. Hartwell | 541 | Premiums | 24 00 | |
| Sept. 28 | M. E. Thompson | 542 | Premiums | 4 00 | |
| Sept. 28 | J. F. Bishop | 543 | Premiums | 4 00 | |
| Sept. 28 | L. B. Congdon | 544 | Premiums | 4 00 | |
| Sept. 28 | Mrs. M. Woodruff | 545 | Premiums | 3 00 | |
| Sept. 28 | Mrs. A. R. Knight | 546 | Premiums | 2 00 | |
| Sept. 28 | Mrs. F. M. Curtis | 547 | Premiums | 1 00 | |
| Sept. 28 | Mrs. S. Totman | 548 | Premiums | 4 00 | |
| Sept. 28 | Mrs. Porter Hedge | 549 | Premiums | 1 00 | |
| Sept. 30 | A. B. Hughes | 550 | Premiums | 16 00 | |
| Sept. 30 | Mrs. L. L. Burke | 551 | Premiums | 14 70 | |
| Sept. 30 | Jane Cassaday | 552 | Premiums | 3 00 | |
| Sept. 30 | Mrs. W. Trumbull | 553 | Premiums | 15 60 | |
| Sept. 30 | C. M. Leighton | 554 | Premiums | 12 00 | |
| Sept. 30 | Mrs. E. M. Wells | 555 | Premiums | 5 00 | |
| Sept. 30 | Ada W. Smith | 556 | Premiums | 10 40 | |
| Sept. 30 | Mrs. A. W. Morton | 557 | Premiums | 10 00 | |
| Sept. 30 | A. D. Alexander | 558 | Premiums | 10 40 | |
| Sept. 30 | Mrs. B. F. Cole | 559 | Premiums | 20 70 | |
| Sept. 30 | Miss Anna Pool | 560 | Premiums | 10 20 | |
| Sept. 30 | Mrs. S. M. Mitchell | 561 | Premiums | 14 70 | |
| Sept. 30 | Mrs. Charles Crooks | 562 | Premiums | 16 80 | |
| Sept. 30 | Nellie Mitchell | 563 | Premiums | 14 00 | |
| Sept. 30 | Mrs. S. J. Temple | 564 | Premiums | 9 00 | |
| Sept. 30 | Mrs. Kate Buck | 565 | Premiums | 6 20 | |
| Sept. 30 | Mrs. E. Rawlins | 566 | Premiums | 15 60 | |
| Sept. 30 | Mrs. Mary Baldwin | 567 | Premiums | 4 00 | |
| Sept. 30 | Lizzie McAlpine | 568 | Premiums | 6 50 | |
| Sept. 30 | Mrs. Ann Parks | 569 | Premiums | 5 00 | |
| Sept. 30 | E. C. Pike | 570 | Premiums | 6 00 | |
| Sept. 30 | Thornburn Sisters | 571 | Premiums | 2 00 | |
| Sept. 30 | Mrs. W. Q. Bell | 572 | Premiums | 4 00 | |
| Sept. 30 | Mrs. I. Foley | 573 | Premiums | 4 00 | |
| Sept. 30 | Mrs. F. E. Greeg | 574 | Premiums | 3 00 | |
| Sept. 30 | Elijah Allen | 575 | Premiums | 9 50 | |
| Sept. 30 | Mrs. Lydia Bohanan | 576 | Premiums | 4 00 | |
| Sept. 30 | John Hawkins | 577 | Premiums | 17 40 | |
| Sept. 30 | Grace E. Currier | 578 | Premiums | 5 20 | |
| Sept. 30 | Romeo Hogue | 579 | Premiums | 4 00 | |
| Sept. 30 | Charles Beerup | 580 | Premiums | 7 50 | |
| Sept. 30 | J. W. Bonk | 581 | Premiums | 30 50 | |
| Sept. 30 | Meek & Kent | 582 | Premiums | 1 00 | |
| Sept. 30 | L. R. Brown | 583 | Premiums | 1 50 | |
| Sept. 30 | N. Baxter | 584 | Premiums | 6 00 | |
| Sept. 30 | Mabel Merrill | 585 | Premiums | 6 40 | |
| Sept. 30 | Mrs. Chas. Bruce | 586 | Premiums | 5 00 | |

WARRANTS ISSUED FOR THE YEAR 1889—Continued.

| DATE. | TO WHOM DRAWN. | NO. | FOR WHAT DRAWN. | AMT. | AMT. |
|---|---|---|---|---|---|
| Sept. 30 | Maggie Johnston | 587 | Premiums | $6 00 | |
| Sept. 30 | O. J. Gilchrist | 588 | Premiums | 3 00 | |
| Sept. 30 | Mrs. S. A. Hoyt | 589 | Premiums | 5 20 | |
| Sept. 30 | Mrs. D. Johnson | 590 | Premiums | 8 00 | |
| Sept. 30 | Mrs. E. P. Ewing | 591 | Premiums | 5 00 | |
| Sept. 30 | Lillie Wollcott | 592 | Premiums | 2 00 | |
| Sept. 30 | Mrs. H. E. Adams | 593 | Premiums | 3 20 | |
| Sept. 30 | Mrs. M. A. Dixon | 594 | Premiums | 5 20 | |
| Sept. 30 | Lucy E. Phillips | 595 | Premiums | 5 00 | |
| Sept. 30 | Mrs. G. H. Littlefield | 596 | Premiums | 6 00 | |
| Sept. 30 | Mrs. Mary Palmer | 597 | Premiums | 7 60 | |
| Sept. 30 | Miss M. Kramer | 598 | Premiums | 7 40 | |
| Sept. 30 | Mrs. M. A. Chambers | 599 | Premiums | 5 00 | |
| Sept. 30 | Mrs. I. Bennett | 600 | Premiums | 4 00 | |
| Sept. 30 | Anna M. Bent | 601 | Premiums | 3 00 | |
| Sept. 30 | W. S. Worden | 602 | Premiums | 2 00 | |
| Sept. 30 | J. A. Hayden | 603 | Premiums | 3 00 | |
| Oct. 1 | T. W. Townsend | 604 | Premiums | 3 00 | |
| Oct. 1 | Mrs. F. Lawrence | 605 | Premiums | 2 00 | |
| Oct. 1 | Mrs. L. U. Parsons | 606 | Premiums | 1 00 | |
| Oct. 1 | A. Bricker | 607 | Premiums | 2 40 | |
| Oct. 1 | H. Shergeman | 608 | Premiums | 1 50 | |
| Oct. 1 | Joseph Markham | 609 | Premiums | 2 40 | |
| Oct. 1 | W. H. Smith | 610 | Premiums | 4 00 | |
| Oct. 1 | Curtis Mills | 611 | Premiums | 1 00 | |
| Oct. 1 | G. Bodeman | 612 | Premiums | 2 00 | |
| Oct. 1 | Mrs. E. F. Denny | 613 | Premiums | 2 00 | |
| Oct. 1 | B. G. Fenner | 614 | Premiums | 2 00 | |
| Oct. 1 | W. W. Woodward | 615 | Premiums | 4 00 | |
| Oct. 1 | Joel Hiser | 616 | Premiums | 2 40 | |
| Oct. 1 | J. M. Young | 617 | Premiums | 4 00 | |
| Oct. 1 | Harry Hedley | 618 | Premiums | 4 00 | |
| Oct. 1 | G. Samrnke | 619 | Premiums | 2 00 | |
| Oct. 1 | Eva George | 620 | Premiums | 4 00 | |
| Oct. 1 | Joseph Papick | 621 | Premiums | 2 00 | |
| Oct. 1 | John D. Heater | 622 | Premiums | 1 50 | |
| Oct. 1 | Mrs. A. Richards | 623 | Premiums | 2 00 | |
| Oct. 1 | Mrs. E. Crosby | 624 | Premiums | 3 00 | |
| Oct. 1 | Rachel E. Wolf | 625 | Premiums | 1 00 | |
| Oct. 1 | James Smith | 626 | Premiums | 1 00 | |
| Oct. 1 | Mrs. E. J. Montgomery | 627 | Premiums | 2 00 | |
| Oct. 1 | Mrs. Johnson | 628 | Premiums | 2 00 | |
| Oct. 1 | Miss Grace Ramsey | 629 | Premiums | 1 00 | |
| Oct. 1 | Mrs. J. O. Carter | 630 | Premiums | 1 00 | |
| Oct. 1 | Mrs. C. L. Shonicker | 631 | Premiums | 2 00 | |
| Oct. 1 | Mrs. C. M. Gray | 632 | Premiums | 3 50 | |
| Oct. 1 | Mrs. S. P. Starkey | 633 | Premiums | 2 50 | |
| Oct. 1 | Phoebe Phillips | 634 | Premiums | 3 00 | |
| Oct. 1 | Mrs. D. Housel jr. | 635 | Premiums | 4 00 | |
| Oct. 1 | Mary E. Finley | 636 | Premiums | 2 00 | |
| Oct. 1 | Mrs. E. Cummings | 637 | Premiums | 1 00 | |
| Oct. 1 | Mrs. W. X. Blaine | 638 | Premiums | 1 00 | |
| Oct. 1 | Mrs. H. T. Whittock | 639 | Premiums | 4 00 | |
| Oct. 1 | Mrs. O. Anderson | 640 | Premiums | 2 00 | |
| Oct. 1 | Alma A. Pike | 641 | Premiums | 1 00 | |
| Oct. 1 | Miller & Paine | 642 | Premiums | 1 50 | |
| Oct. 1 | Jones, Douglas & Co. | 643 | Premiums | 2 50 | |
| Oct. 1 | Mrs. W. C. Millar | 644 | Premiums | 3 20 | |
| Oct. 1 | Mrs. Lu Guile | 645 | Premiums | 1 00 | |
| Oct. 1 | Mrs. H. H. Bulkeley | 646 | Premiums | 2 00 | |
| Oct. 1 | Mrs. H. H. Wilson | 647 | Premiums | 2 00 | |
| Oct. 1 | Mrs. Joseph Balshaw | 648 | Premiums | 3 50 | |
| Oct. 1 | Mary E. Grimes | 649 | Premiums | 1 00 | |
| Oct. 1 | Mrs. W. E. Slough | 650 | Premiums | 1 00 | |
| Oct. 1 | Mrs. Fred Matson | 651 | Premiums | 2 00 | |
| Oct. 1 | Mrs. J. O. Spahr | 652 | Premiums | 3 00 | |
| Oct. 1 | Mrs. A. W. McLaughlin, | 653 | Premiums | 2 00 | |
| Oct. 1 | Mrs. T. C. White | 654 | Premiums | 2 00 | |
| Oct. 1 | Gertie Snyder | 655 | Premiums | 3 20 | |
| Oct. 1 | Mrs. Wm. Boyle | 656 | Premiums | 1 00 | |
| Oct. 1 | Mrs. C. B. Kyser | 657 | Premiums | 2 00 | |
| Oct. 1 | Mrs. W. Myre | 658 | Premiums | 1 00 | |
| Oct. 1 | Mrs. C. S. Taylor | 659 | Premiums | 3 00 | |

### WARRANTS ISSUED FOR THE YEAR 1889 — CONCLUDED.

| DATE. | TO WHOM DRAWN. | NO. | FOR WHAT DRAWN. | AMT. | AMT. |
|---|---|---|---|---|---|
| Oct. 1 | Laura Ireland | 660 | Premiums | $2 00 | |
| Oct. 1 | Nina Householder | 661 | Premiums | 4 00 | |
| Oct. 1 | Walter D. Hunter | 662 | Premiums | 6 00 | |
| Oct. 2 | Mrs. E. H. Cushman | 663 | Premiums | 2 00 | |
| Oct. 2 | Mrs. Tillie Moore | 664 | Premiums | 2 00 | |
| Oct. 2 | Mrs. A. B. Miner | 665 | Premiums | 1 00 | |
| Oct. 2 | Mrs. C. W. Sholes | 666 | Premiums | 4 00 | |
| Oct. 2 | Mrs. J. D. Slade | 667 | Premiums | 2 00 | |
| Oct. 2 | Mrs. F. E. Gage | 668 | Premiums | 50 | |
| Oct. 2 | Adele Simmons | 669 | Premiums | 1 00 | |
| Oct. 2 | Miss Emma Patmore | 670 | Premiums | 1 00 | |
| Oct. 2 | Myrtle Bohanan | 671 | Premiums | 1 00 | |
| Oct. 2 | Minnie B. Latta | 672 | Premiums | 2 00 | |
| Oct. 2 | Bessie Munson | 673 | Premiums | 4 00 | |
| Oct. 2 | Bess E. Ringer | 674 | Premiums | 2 00 | |
| Oct. 2 | E. D. Harris | 675 | Premiums | 2 00 | |
| Oct. 2 | W. K. Roberts | 676 | Premiums | 1 00 | |
| Oct. 2 | Harley Husted | 677 | Premiums | 4 00 | |
| Oct. 2 | Robt. Weese | 678 | Premiums | 8 00 | |
| Oct. 3 | Nellie E. Lownes | 679 | Premiums | 1 00 | |
| Oct. 2 | Anna Yule | 680 | Premiums | 2 00 | |
| Oct. 2 | Mrs C. J. Kellum | 681 | Premiums | 1 00 | |
| Oct. 2 | J. D. Wood | 682 | Premiums | 2 40 | |
| Oct. 2 | C. E. Termohlen | 683 | Premiums | 2 00 | |
| Oct. 2 | Mrs. Ed. Marringer | 684 | Premiums | 1 00 | |
| Oct. 5 | R. W. Furnas | 685 | Expenses to Peoria | | $21 50 |
| Oct. 5 | Kendall & Smith | 686 | Expenses to Buffalo | | 7 50 |
| Oct. 5 | Bohanan Bros | 687 | Livery | | 16 00 |
| Oct. 5 | Wessel Printing Co | 688 | Printing | | 178 00 |
| Oct. 5 | J. D. Hardin | 689 | Error in speed | | 6 00 |
| Oct. 7 | L. A. Kent | 690 | McEvoy protest | | 17 00 |
| Oct. 7 | Home Farm St'k Co | 691 | Premiums | 12 00 | |
| Oct. 7 | O. Compton | 692 | Premiums | 8 00 | |
| Oct. 7 | A. Palmer | 693 | Premiums | 4 00 | |
| Oct. 8 | Mrs. M. L. Trester | 694 | Premiums | 1 00 | |
| Oct. 8 | | 695 | | | |
| Oct. 19 | C. E. Bessey | 696 | Botanist | | 50 00 |
| Oct. 19 | J. D. Macfarland | 697 | Work on track | | 25 00 |
| Oct. 21 | M. P. Jensen | 698 | Premiums | 8 00 | |
| Oct. 22 | Fred Wohlen | 699 | Premiums | 5 00 | |
| Oct. 24 | Ed. Brown | 700 | Balance due engine | | 3 00 |
| Oct. 24 | N. H. Gentry | 701 | Expert—sheep | | 25 00 |
| Nov. 4 | R. W. Furnas | 702 | Fourth quarter salary | | 500 00 |
| Nov. 4 | State Hort. Society | 703 | Annual appropriation | 1000 00 | |
| Nov. 4 | Neb. Farmer | 704 | Advertising | | 7 50 |
| Nov. 5 | R. L. Smith | 705 | Power supplies | | 8 30 |
| Nov. 7 | S. C. Bassett | 706 | Dairy exhibits | | 50 00 |
| Nov. 8 | Interstate Ass'n Fairs and Expositions | 707 | Dues | | 10 25 |
| Nov. 8 | | 708 | | | |
| Nov. 26 | J. E. Utt | 709 | Straw | | 378 00 |
| Nov. 29 | R. W. Furnas | 710 | Exp. to Chicago and Mil | | 61 55 |
| Nov. 29 | C. E. Weister | 711 | Tel. and Ex., Oct | | 6 35 |
| Nov. 29 | Geo. Arkwright | 712 | Corn pins | | 3 50 |
| Nov. 29 | R. T. Rainey | 713 | Postage, Sept. and Oct | | 8 20 |
| Nov. 29 | C. E. Weister | 714 | Ex. and Tel., Sept | | 8 20 |
| Dec. 6 | C. E. Weister | 715 | Ex. and Tel., Nov | | 21 02 |
| Dec. 12 | Grace L. Gillespie | 716 | Premiums | 2 00 | |
| Dec. 19 | L. A. Kent | 717 | Livery | | 12 75 |
| Dec. 19 | R. R. Greer | 718 | Expenses to Chicago | | 40 00 |
| Dec. 19 | J. B. Dinsmore | 719 | Expenses to Chicago | | 47 75 |
| Dec. 19 | M. Dunham | 720 | Expenses to Chicago | | 25 05 |
| Dec. 19 | G. Ensign | 721 | Livery | | 4 00 |
| Dec. 23 | H. Carstens | 722 | Premium | 2 00 | |
| Dec. 31 | R. T. Rainey | 723 | Postage, Nov. and Dec | | 50 70 |
| Dec. 31 | C. E. Weister | 724 | Ex., Fgt., and Tel., Dec | | 44 82 |
| | | | Total premiums | $15523 70 | |
| | | | Total expenses | | $21032 13 |
| | | | Total amount of warrants | | 36555 83 |

These reports were all three referred to a committee of three, consisting of Ed. McIntyre, of Seward county; Milton Doolittle, of Holt county; R. T. McGrew, of Phelps county. This committee in due time submitted the following report, which was adopted:

"*Mr. President and Gentlemen of the Nebraska State Board of Agriculture:* We, the undersigned, your committee appointed to examine and report on the Secretary's and Treasurer's reports, and the address of the President, for the year ending January 1, 1890, beg leave to submit the following:

"That we have carefully examined the bills and vouchers of the Board of Managers with the stubs and warrants drawn by the Secretary, (and also the detailed statement of warrants drawn by the Secretary,) with the warrants issued by the Secretary, and those that have been presented to and paid by the Treasurer, and find the same correspond, and are correct as reported by the said Secretary and Treasurer.

"Total amount of the warrants drawn by the Secretary, from No. 1 to No. 724, inclusive, $36,555.83.

"We find warrant No. 333, for $8.00, drawn but not delivered.

"We find also warrant No. 282, for $1.65, drawn but not delivered.

"We find also warrant No. 283, for $0.65, drawn but not delivered, the three amounting to $10.30.

"We find also warrant No. 457, for $2.00, issued but unpaid.

"We find also warrant No. 602, for $2.00, issued but unpaid.

"We find also warrant No. 608, for $1.50, issued but unpaid.

"We find also warrant No. 611, for $1.00, issued but unpaid.

"We find also warrant No. 614, for $2.00, issued but unpaid.

"We find also warrant No. 644, for $3.20, issued but unpaid.

"We find also warrant No. 684, for $1.00, issued but unpaid.

"We find also warrant No. 693, for $4.00, issued but unpaid. These make a total of $16.70, and a grand total of $27.00, showing amount actually paid of $365,38.83, while the report of treasurer, which closes the year January 21, 1890, shows:

| | |
|---|---|
| Balance on hand January 15, 1889 | $9656 03 |
| Total receipts for year ended | 35608 50 |
| Grand total | $45264 53 |
| Total amount warrants paid | 36487 33 |
| Balance on hand | $8777 20 |

"Your committee find that they are unable to check the Treasurer's report, because of the system or lack of system exercised under the methods practiced, and recommend to you that the rule be so amended that a record of all moneys received be entered upon the books and reports of the Secretary, to provide that all moneys belonging to the board shall pass through the Secretary's hands and be by him paid over to and receipted for by the Treasurer.

"Your committee find themselves quite in sympathy with the views expressed by the Secretary relating to farmers' institutes, and the coming world's fair, and recommend same for endorsement by this board.

"Referring to the President's address, and more particularly to that clause relating to an increase of pay to the Secretary, we have to report that we recognize the faithful, able, and efficient way in which the Secretary's office is run, and the pleasant and cheery manner with which he performs and disposes of his many perplexing duties; and while we recognize all this, we feel that the salary of two thousand dollars per annum is all that this board can afford to pay, as salary, in view of the fact that by custom his hotel bills and railroad fares (when contracted) are met and paid by the board when he is in discharge of his duties.

"However, we find that in the last three or four years this board has paid for extra clerk hire in the Secretary's office, during each year, amounts ranging from $600 to $800, annually; therefore we recommend that there be appropriated the sum of six hundred dollars, to be paid out in the discretion of the Board of Managers for extra clerk hire in the secretary's office.

"All of which is respectfully submitted.

"EDMUND MCINTYRE,
"*Chairman.*
"MILTON DOOLITTLE.
"R. T. MCGREW."

On motion, it was resolved that a committee of five be appointed, to whom all nominations to fill vacancies in the board shall be referred, to report to this board the most suitable person, localities and qualifications to be considered; that the chairman of said committee shall be a president of some county agricultural association.

The President appointed the following as said committee: M. S. Price, of Clay county; James E. North, of Platte county; M. Dunham, of Douglas county; H. K. Larson, of Otoe county; J. B. Dinsmore, of Clay county.

The following nominations were made and submitted to the committee:

| | |
|---|---|
| L. A. Kent | Kearney county. |
| R. B. Windham | Cass county. |
| M. Doolittle | Holt county. |
| J. D. Macfarland | Lancaster county. |
| D. J. Miles | Gage county. |
| C. D. Schrader | Logan county. |
| H. C. Jones | Frontier county. |
| F. Clingman | Butler county. |
| Ed. McIntyre | Seward county. |
| W. R. Bowen | Douglas county. |
| R. T. McGrew | Phelps county. |
| W. H. Dickison | Saunders county. |
| J. M. Lee | Furnas county. |
| W. R. Harris | Johnson county. |
| Mr. Lichty | Richardson county. |
| S. M. Barker | Merrick county. |
| J. B. McDowell | Jefferson county. |
| R. R. Greer | Buffalo county. |
| M. L. Hayward | Otoe county. |
| S. H. Webster | Valley county. |
| E. L. Vance | Pawnee county. |
| D. E. Osgood | Lincoln county. |
| W. L. May | Dodge county. |
| W. M. Robertson | Madison county. |
| H. Piaskii | Howard county. |

| | |
|---|---|
| W. H. Holmes | Antelope county. |
| E. J. Hubbell | Buffalo county. |
| A. P. Cully | Sherman county. |
| A. J. Leach | Antelope county. |
| Mr. Coville | Hamilton county. |
| L. A. Browne | Dawes county. |
| G. H. Smith | Nuckolls county. |
| R. G. McCowan | Thomas county. |
| C. R. Glover | Brown county. |
| H. Eicke | Douglas county. |
| D. W. Wildman | Hitchcock county. |
| P. H. Berry | Greeley county. |
| O. Richards | Hayes county. |
| T. Smith | Johnson county. |
| Job Hathaway | Box Butte county. |

## SECOND DAY.

LINCOLN, January 22, 1890.

Called to order, President Greer in the chair. Robert W. Furnas, Secretary. The roll being called, a quorum was found to be present.

The committee on nominations to report names of persons to fill vacancies on the board, reported as follows, which report was adopted, and the parties named were declared duly elected for the term of two years:

Your committee to whom was referred the nominees from which to select fifteen names as suitable persons to fill the vacancies occurring on the State Board would report as follows:

| | |
|---|---|
| L. A. Kent | Kearney county. |
| J. D. Macfarland | Lancaster county. |
| Ed. McIntyre | Seward county. |
| W. R. Bowen | Douglas county. |
| S. M. Barker | Merrick county. |
| J. B. McDowell | Jefferson county. |
| R. R. Greer | Buffalo county. |
| M. L. Hayward | Otoe county. |
| S. H. Webster | Valley county. |
| W. L. May | Dodge county. |
| Milton Doolittle | Holt county. |
| W. H. Holmes | Antelope county. |
| R. G. McCowan | Thomas county. |
| E. L. Vance | Pawnee county. |
| J. M. Lee | Furnas county. |

M. S. PRICE,
J. E. NORTH,
H. K. LARSON,
M. DUNHAM,
J. B. DINSMORE,
*Committee.*

The following communication from the Board of Regents, University of Nebraska, was read. The plan proposed was approved by a vote of the board, and the president authorized to name a committee of three to perform duties as indicated in the communication:

LINCOLN NEBRASKA, December 20, 1889.

"*The State Board of Agriculture, Robert W. Furnas, Secretary, Brownville, Nebraska:* GENTLEMEN—I am directed by the Board of Regents to advise you that at their session just closed in this city, at which certain questions were discussed relating to the Experiment Farm and Agricultural Experiment Station of Nebraska, it was by said board ordered:

"That the State Board of Agriculture be requested to appoint a special committee (of such number as may seem to them suitable) to consult with a like committee of this board touching certain questions concerning the management of said farm, and the work of said station, the joint committees to report their conclusions and recommendations to the Board of Regents at their next meeting; and that the Secretary be instructed to notify the Board of Agriculture of this action.

"With your permission, I would suggest that this committee on the part of the Board of Agriculture number not more than three members, if practicable, because the Board of Regents is a small body, and its representatives, under its new organization on and after January 1, next, reside at points widely separated in the State, on account of which a meeting of a committee of a large number might be difficult to arrange.

"If you will advise me as soon as the Board of Agriculture nominate their committee, I will communicate with the Board of Regents or its members that the committee on the part of the board may be nominated with as little delay as possible, and advise you of the results, that the joint committee may be organized for work as soon as practicable. Very truly yours, J. S. DALES,

"*Steward.*"

The following persons were named by the President as the committee provided: Robert W. Furnas, of Nemaha county; P. H. Barry, of Greeley county; S. C. Bassett, of Buffalo county.

Mr. Greer, from the committee to visit the Illinois State Fair, reported as follows:

## REPORT OF THE DELEGATION TO ILLINOIS STATE FAIR.

*To the Nebraska State Board of Agriculture:* Your delegation honored with the pleasing duty of visiting the Illinois State Fair, at Peoria, September 23d to 27th, last, report having done so.

"To visit a fair under the auspices and management of the Illinois State Board of Agriculture, is a rare treat, both of pleasure and profit. This fair association is one of the oldest and best regulated and managed in the West. It is progressive in all its characteristics, keeping pace with the spirit and demands of the day. The standards of excellence established and governing exhibits and awards at this fair are the highest order. Hence competition is always active and sharp, and results decisive, and of marked value. While the grounds at Peoria are small—forty acres only—they are admirably and advantageously arranged, with all modern improvements and conveniences. This was especially so in the matter of live-stock barns for accommodations. The entire grounds on which the fair was held, are composed of a grove of young growth native timber, affording luxury in that respect.

"The wide-awake, enterprising people of Peoria, appreciating the many advantages of a State Fair to the city, displayed their characteristic liberality in fitting and preparing the grounds and other accommodations. In all your delegation witnessed and examined, it can but feel it was profited in fair lessons learned.

"We would be remiss in performance of duty did we fail in this report to make due acknowledgment of the many acts of courtesy and hospitality extended by the Illinois fair officials and management, to the representatives of the Nebraska State Board. The debt can only be paid in kind, to do which we trust the opportunity is in the near future, a delegation being promised to visit the next Nebraska State Fair.

"Thanking this board for the honor of serving on this mission, we are, respectfully,

"R. R. Greer,
"Robert W. Furnas,
"*Committee.*"

Mr. Furnas, chairman of the committee designated by this board to visit and report as to the State Industrial farm, submitted the following report:

## THE NEBRASKA STATE INDUSTRIAL FARM.

"*To the Nebraska State Board of Agriculture:* Your committee designated to visit, annually, the Nebraska State industrial farm, having performed that duty for the year 1889, report:

"The committee confess to anxious solicitude that this farm be made to accomplish more practical benefits to the general farming interests of the State, and will rejoice if able in any manner to contribute, by suggestion or otherwise, to that end. A field for such valuable work as should and can be prosecuted at this farm, is open; the demand is general and of no uncertain tenor.

"As was stated in the last report, we repeat: a seeming fatality, in so far as practical work and results are concerned, seems to have followed the footsteps of this line of work from infancy, as it were. We know of no more expressive utterance, than to say: there has been a lack of appreciation on the part of the public, as to the real worth and demand for such an institution. Hence, at least partial distrust and want of confidence, so to speak, has prevailed, which has hampered and crippled efforts of the management having in charge. This was and is much to be regretted, and tends to discourage operators and friends who labor and look for better and more fruitful results. We feel warranted in expressing the belief that the management even under such adverse conditions, had won its way, and obtained place in the public estimation. By an omission on the part of the last Legislature, in some way, no provision whatever was made to carry forward the work on the industrial farm. It was thus left entirely without State support or aid of any kind. The National Experiment Station management, rather than permit the farm to remain idle and go to decay, took it in charge, and from the Government fund appropriated sufficient to maintain it for the current two years.

"By this it will be seen that the whole State farm to-day in fact is simply a piece of apparatus by grace attached to the experiment station, supported by the General Government. This is far from what it should be, and is in no wise creditable to the State of Nebraska. The work contemplated by the generous act of Congress, is, in a measure, deprived of its legitimate and intended scope and work, and the meager stipend, at the same time, does not enable the farm to do what it should, and what is expected from it.

"The committee is not enamored with the industrial feature of the farm. That is, we fail to see how or wherein it can practically be made a workshop, or means of employment for agricultural students, more especially under existing environments. The thought occurs that the whole farm can be devoted to experiment work, and with more satisfactory results. With proper management, there can be no little revenue obtained to aid in its support; perhaps, in the near future, it may become self-sustaining.

"The State should, in justice to itself, be more liberal than ever, before total deprivation, and thus afford an opportunity to demonstrate usefulness, which, to repeat, we are satisfied there is demand for, and which is feasible.

"Experimenting in live-stock feeding could be advantageously entered upon with promising results. Both, the stock and food can be provided for on the farm, and thus, as it were, a sort of double system of experiment work carried forward. We are of the further opinion that the rapidly-growing factor, the dairy industry of the State, demands experimental work, and that it can be profitably and advantageously prosecuted, and also, that experiments in irrigating could be made of especial profit to the western portions of the State.

"Your committee will not attempt here to submit or propose plans, or specifications, but will let the general references indicated, suffice, with the hope that attention being called, remedies will follow.

"The Regents of the university have, by resolution, signified their desire to co-operate with this board in matters pertaining to the welfare and prosperity of the State farm. To this end, they invite you to appoint a conference committee to join them in devising means for the welfare and advancement of agriculture and its kindreds, in Nebraska. The action of the Regents is herewith also submitted. Your committee recommend the co-operative plan and work invited by the Regents.

"Respectfully submitted.

"ROBERT W. FURNAS,
"ED. MCINTYRE,
"J. JENSEN,
"*Committee.*"

Mr. Dinsmore, delegate to the American Short-horn Breeders' Association, submitted the following report:

"As your accredited representative, I attended the meeting of the American Short-horn Breeders' Association, in the city of Chicago, on the 20th of November last. There were representative breeders present from more than twenty states, who have helped to carry this grand old breed of cattle to victory in many an arena where the contest was hot and the foeman worthy.

"Among other things, it was decided to offer to the different state boards of agriculture, two hundred and fifty dollars as special premiums to be awarded to cattle of this breed that are entered in the dairy class, and are allowed to compete with other dairy cattle in the milk and butter tests. It was also decided to continue the appropriations heretofore made for premiums for animals of this breed that had won premiums at the fat-stock show held in the city of Chicago. I cannot but think that this association is doing a grand work in helping to bring out the magnificent animals that are shown year by year at our leading fairs.

"JOHN B. DINSMORE."

Mr. Furnas, delegate to the International Association Fairs and Expositions, and the Western Circuit of State Fairs, reported as follows:

"As your accredited delegate to these organizations, I report in brief: The first named met in the city of Milwaukee, Wis., November 13 and 14, last. This association embraces all the United States and Canada. The attendance from both sections of country, was larger than ever before, and unusual interest manifested. The objects of this organization are more particularly for consultation, and to devise the best and most uniform modes of successfully and satisfactorily conducting fairs and expositions. Valuable papers were read on various subjects, followed by able and profitable discussions, the details of which would be impracticable in this place. Suffice it, there was much important information imparted and obtained, which will in due time bear fruit among the active workers and friends in this class of object-lesson schools, and modes of advertising products and resources of the land. Officers for the current year, Robert W. Furnas, Nebraska, President, and H. J. Hill, Toronto, Canada, Secretary and Treasurer.

"The Western Circuit of State Fairs, composed of the States of Wisconsin, Minnesota, Illinois, Iowa, Nebraska, Kansas, Indiana, and Missouri, held its annual meeting at Chicago, November 19. The principal object of this society is to arrange fair dates, in order to prevent conflict, and to secure as far as may be uniform premiums, rules, and usages, governing fairs. All the States were represented and the following dates agreed upon for the fair season of 1890: Iowa, commencing, on the first Monday in September; Nebraska and Minnesota, on the second Monday; Kansas and Wisconsin, on the third Monday; Indiana, on the fourth Monday; Illinois, on the fifth Monday; and Missouri, on the first Monday in October. In each State the Fridays and Saturdays next preceding the opening Monday are to be used as preparation days. These dates are subject to approval or disapproval of the State associations, or managements. So far, all the States holding meetings since the meeting at Chicago, have confirmed the dates named. It is now for this board to act.

"The work in this district or circuit is already so near uniform as to require no changes of note, on the part of any one.

"Officers for the coming year, Robert W. Furnas, Nebraska, President; E. C. Lewis, Illinois, Secretary.

"At both of these meetings, unanimous resolutions were passed in favor of Chicago as the point at which the coming World's Fair should be held.

"R. W. FURNAS,
"*Delegate.*"

The reports of Messrs. Greer, Furnas, and Dinsmore, hereinbefore mentioned, were submitted to a committee of three, consisting of P. H. Barry, of Greeley county; J. M. Lee, of Furnas county; G. B. Chase, of Gosper county.

This committee in due time reported as follows, the report being adopted:

"*To the State Board of Agriculture:* The committee to whom was reported the several reports of delegations to the Illinois State Fair; International Association of Fairs and Expositions; Western Circuit of Fairs; American Short-horn Association; and the committee to visit the State industrial farm, has carefully considered the same, and report:

"In the matter of industrial farm, there should be hearty co-operation on the part of the State Board of Agriculture and the farmers of Nebraska, in connection with the industrial farm and experiment station.

"We recommend that the experiment station take up the work of live-stock feeding, that the farmers in the State may profit thereby; that the work of the station be confined to the most important crops produced in Nebraska; that the university pay the salaries of the professors of the Industrial College wholly from the funds of the university, thereby leaving a greater amount of money for experimental work; that a committee of three be appointed to act in conjunction with the Regents of the university, as by them solicited. We also suggest such further legislation by our State Legislature as will render the Nebraska Experiment Station more useful.

"In the matter of official visit to the Illinois State Fair, your committee is pleased with the mode of fraternal interchange of experience and thought.

"The selection of our honored Secretary as President of both the International Association of Fairs and Expositions, and the Western Circuit of Fairs, is an evidence of appreciation our board may well be proud of.

"Your committee recommend that we adopt the dates fixed by the Western Circuit of Fairs, viz., to commence on the second Monday in September next; also, that the report of the delegate to the American Short-horn Association be accepted as satisfactory, and that all these reports be placed on file and printed with the proceedings of this board.

"P. H. BARRY,
"G. B. CHASE,
"J. M. LEE,
"*Committee.*"

It was ordered by vote that the President name a committee of three to act in conjunction with the Nebraska Experiment Station, State Horticultural Society, State Dairymen's Association, and other kindred organizations in the State, to devise modes and means for a system of State farmers' institutes. The President appointed Robt. W. Furnas, of Nemaha county; P. H. Barry, of Greeley county; S. C. Bassett, of Buffalo county.

Mr. McIntyre, a committee of one appointed at the last semi-annual meeting of the board, September, 1889, to prepare resolutions appreciative of the services rendered the State Fair, reported the following, which were adopted by a unanimous vote:

WHEREAS, The entire press of Nebraska, ever characterized for its enterprise and liberality in all things tending to the welfare and advancement of the State, has ever signally aided the Nebraska State Board of Agriculture in its efforts to that end; therefore,

*Resolved*, That in this public manner acknowledgment is hereby made, and thanks extended for the many acts of kindness and aid rendered this board in its work.

*Resolved*, That the Secretary be and is hereby directed to furnish the President and Secretary of the Nebraska State Press Association, each, with a copy of this preamble and resolutions.

WHEREAS, All railroads operating in Nebraska, have, always, heretofore been exceedingly liberal in their treatment of the Nebraska State Board of Agriculture, in matters of reduced passenger rates, assisting with free distribution of advertising matter, and more particularly in furnishing substantially free freight rates in the State, for all exhibits at State Fairs, to and from, in this outstripping the like in any other state in the Union; and

WHEREAS, Largely the grand success of our Fairs is attributable to this liberal treatment; therefore,

*Resolved*, That unqualified thanks of this board are hereby tendered to the said railroad companies for the liberal aid extended in matters as indicated.

*Resolved*, That the Secretary be and is hereby instructed to furnish the General Manager of each road with copies of these preambles and resolutions.

WHEREAS, The express companies operating in Nebraska, by their liberality in the free distribution of all advertising matter pertaining to Nebraska State Fairs and Expositions, and other parcels in which the board officially are directly interested, merit the recognition of this body; therefore,

*Resolved*, That the thanks of the State Board of Agriculture be and are hereby extended said express companies; and

*Resolved*, That the Secretary be instructed to furnish each company with a copy of this preamble and resolutions.

WHEREAS, "A multitude without number" of the enterprising people of Nebraska, and of the New West generally, have, in "ways and manner untold," as exhibitors, patrons, and in labor, aided this board in its successful efforts to advance the interests of the State and benefit the public; therefore,

*Resolved*, That "thanks unstinted" be and are hereby extended to all who have in any way, by time, attention, or otherwise, assisted the board in its work, especially in making our annual fairs and expositions the best known.

*Resolved*, That these preambles and resolutions be given publicity by publication in state papers.

The following was adopted as a vote of thanks to Lieutenant Griffith for use of Grant Memorial Armory Hall, for the winter corn show:

WHEREAS, Lieut. Thos. W. Griffith, commandant military department University of Nebraska, kindly tendered this board, for its use in making the annual corn exhibit, the use of the Armory in Grant Memorial Hall; therefore,

*Resolved*, That the thanks of this board be and are hereby tendered for the favor indicated in the above preamble, and that the Secretary be directed to furnish Lieut. Griffith with a copy of this preamble and resolution.

On motion, the board proceeded to the election of officers, which resulted in the following-named persons being chosen for the positions respectively named:

| | |
|---|---|
| R. R. GREER, Kearney county | *President.* |
| J. B. MCDOWELL, Jefferson county | *First Vice President.* |
| E. N. GRENNELL, Washington county | *Second Vice President.* |
| L. A. KENT, Kearney county | *Treasurer.* |
| ROBT. W. FURNAS, Nemaha county | *Secretary.* |

On motion, the Board of Managers, hereafter to be appointed by the President, was authorized to fill all other official positions.

The President announced the following Board of Managers:

R. H. Henry, Columbus, Chairman; J. B. Dinsmore, Sutton; Eli A. Barnes, Grand Island; Martin Dunham, Omaha; J. Jensen, Geneva.

These appointments were confirmed by a vote of the board.

The committee appointed to visit the Nebraska Experiment Station reported as follows:

## REPORT OF THE VISITING COMMITTEE.

"*To the Board of Regents State University of Nebraska:* SIRS—The committee, at your request appointed by the Nebraska State Board of Agriculture and the State Horticultural Society, with a view to ascertain and report the work and accomplishments of the Experiment Station for the current year, having performed the duty, report:

"The annual visit was made by the entire committee during the month of October, and investigations made as carefully and completely as circumstances would admit. In this report it is not the purpose of the committee, nor do we presume it is expected, to enter into minute details of all the work in hand. This, heads of departments, in their respective bulletins, will doubtless provide. Let it suffice to say:

"The committee was pleased to find the work of the station, as respectively apportioned, in highly creditable condition and progress, and quite advanced beyond that of the preceding or any other year.

"Experience and results warrant still stronger commendation as to the judicious and fruitful use of the national appropriation for this purpose. By utilizing forces, apparatus, buildings, etc., in use by the State University, before government aid was provided, the scope of the work and results are shown to be beyond that of other states undertaking to provide separate and distinct organization for experiment work.

"The committee especially approve and commend the policy of selecting a limited number of most important factors, and giving to them exclusive special attention and thorough experimentation. Notably, examination of the character of soils, in order to ascertain adaptability to various crops peculiar to the State. In this connection, too, the question of irrigation is taken into consideration; its feasibility and practicable benefits, more particularly to the western part of Nebraska. We are pleased to know and state in further connection with this subject, that through the efforts of Director Hicks, who met with the national irrigating and water supply committee, successfully inducing a brief session of that body within our borders, that we are promised a share of future congressional appropriations for such uses.

"The sugar-beet industry, claiming and receiving as it now does, so large a share of public attention at large in the United States, is given careful and thorough investigation at this station, showing unexpected and most gratifying results. The saccharine yield of Nebraska-grown beets is found equal with the beet-sugar producing countries in the world. The yield in tons per acre of beets is also most gratifying. Sections of the State and soils, hitherto thought not adapted, are found to be admirably so.

"Meteorology and entomology both are from year to year becoming more important in connection with the industries of the New West.

"These are receiving more extended and marked attention than heretofore. The bulletins from each of these departments will show gratifying and beneficial results.

"Without further itemizing, let these brief references serve as sample characteristic work throughout, your committee was pleased to note and report.

"In way of suggestions, permit attention to be called to the all-important factor, investigation of animal diseases. Unfortunately, this heretofore prominent and successful work of the station we find temporarily suspended. The committee is confident that it but voices a public sentiment in Nebraska, as well as in the west generally, in urging resumption. In the list of our varied products and industries, this one stands out pre-eminently, demanding not only continued, but increased prosecution. The Nebraska station, in this, was at one time not only abreast with, but in advance of all others. We realize the most insurmountable barrier, as it were, of taking up this work again, where it was dropped. We trust wise counsel will enable you to devise plans and provide for the continuation of the work, if only to the best advantage existing circumstances will permit, and at as early a day as possible.

"Another matter impresses your committee. The industrial farm, in connection with the university, should, in our opinion, be made of more practical use and consequent benefit. In the way of further experimentation we suggest that of feeding live stock. Both the stock and feed can be produced on the farm. Very much of this industry is yet to be learned. The farmer of small means is not prepared nor can he afford the work of experiments. Let the State farm do this work and the class of farmers indicated have its benefits.

"In looking over the entire ground of the experiment station and the industrial farm in connection, other practical matters suggest themselves. As, however, means for prosecuting work is limited, we are not inclined to trespass them under the circumstances at present. Time and ability will call for and utilize them in the near future.

"In conclusion, we freely express the conviction that the means and instrumentalities at command of the Nebraska experiment station are being used economically financially, and judiciously — more so, we repeat, than at but few if any others working under the same fostering care.

"ROBERT W. FURNAS,
"W. M. ROBERTSON,
"G. J. CARPENTER,
"*Committee.*"

On motion, the board proceeded by ballot to locate the State Fair for five years. The following propositions were read:

## THE LINCOLN PROPOSITION.

LINCOLN, NEBRASKA, January 21, 1890.

*To the Nebraska State Board of Agriculture:* GENTLEMEN —Referring to the advertisement of your Secretary, asking for proposals for locating the Nebraska State Fair for the next five years:

The Nebraska Exposition Association, and citizens of Lincoln, Nebraska, offer to your board the use of the fair grounds, in the city of Lincoln, together with buildings and improvements thereon, for the accommodation of the Nebraska State Fair for the years 1890 to 1894, inclusive, said grounds being those upon which your fair has been held heretofore.

And in case you vote to hold said State Fair upon said grounds, for the years 1890 to 1894, we agree to make the following improvements in addition to those already upon the property:

1. Erect one new hall, of sufficient size to accommodate the exhibits of fine arts, textile fabrics, and educational department.
2. Add to the present agricultural hall, an increase of seventy-five per cent of its capacity, for the purpose of accommodating in one building, all agricultural products, including the dairy.
3. Erect one new building for poultry exhibits, containing 3,000 feet of floor space.
4. Add to the present bee house, ten by sixteen feet.
5. Add to the present offices of Secretary and Board of Managers on the north side, enlarging those offices to meet the wishes of the officers named.
6. Construct such additional stalls and pens as may be deemed necessary by your Board of Managers, for the accommodation of exhibitors of live stock.
7. Erect new closets for men.
8. Repair and paint the present buildings, where needed.
9. Increase the water supply by extending a four-inch main from the city water works into the grounds.
10. Provide $2,000 each year for increased improvements if necessary.

All of said buildings to be completed and ready for occupancy and all other improvements made, by September 1, 1890.

There are two lines of railroad leading to the entrance to our grounds, with ample facilities for the unloading of live stock, machinery, and all other exhibits, immediately at the gates, conveniences that are afforded few fair grounds, and that add greatly to the comfort and safety of exhibitors and their stock, as well as saving them large expense.

There is one line of railroad and one steam-motor street-car line running from the city into the grounds, and we have reasonable assurance that another car line will be extended to the grounds. These lines, together with the numerous hacks, omnibuses, and other vehicles, afford the most ample means of transportation to and from the grounds, which are, as is well known, within the city limits of Lincoln, and within one mile of the business center thereof.

The improvements now upon our fair grounds have cost over $60,000; the new improvements, herein proposed to be made, will cost $30,000; the grounds alone are worth, at fair estimate, $75,000; so that we offer you for the purposes named, the free use of grounds and improvements of the value of $165,000.

Appended hereunto is a bond in the sum of $50,000 for the faithful performance of all agreements herein made.

THE NEBRASKA EXPOSITION ASSOCIATION.
AUSTIN HUMPHREY, *Secretary.*
By J. D. MACFARLAND, *President.*

KNOW ALL MEN BY THESE PRESENTS: That the Nebraska Exposition Association as principal, and as sureties of the town of Lincoln, county of Lancaster, and State of Nebraska, are held and firmly bound unto the Nebraska State Board of Agriculture, in the penal sum of Fifty Thousand ($50,000) dollars, good and lawful money of the United States, to be paid to the said Nebraska State Board of Agriculture, for which payment, well and truly to be made, we do hereby bind ourselves, our heirs, executors, and administrators, jointly and severally, firmly by these presents.

Dated this 21st day of January, A. D. 1890.

WHEREAS, The above bounden Nebraska Exposition Association did, on the 21st day of January, A. D. 1890, make a written proposition to the said Nebraska State Board of Agriculture, to erect certain buildings, and to make certain other improvements as specified in said proposition, upon the grounds of said Nebraska Exposition Association, in the city of Lincoln, for the accommodation of the Nebraska State Fair, if located upon said grounds for the years 1890 to 1894 inclusive.

NOW THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, That if the above bounden Nebraska Exposition Association shall well and truly perform its said agreements, then this obligation is void; otherwise to be and remain in full force and effect.

THE NEBRASKA EXPOSITION ASSOCIATION.
By J. D. MACFARLAND, *President.*

JOHN R. CLARK.
C. H. IMHOFF.
JOS. BOEHMER.
L. MEYER.
HENRY E. LEWIS.
J. H. MCMURTRY.
K. K. HAYDEN.
C. W. MOSIER.
C. F. BOGGS.
A. HURLBUT.
WALTER J. LAMB.
S. H. BURNHAM.
WM. M. CLARK.

## THE HASTINGS PROPOSITION.

HASTINGS, NEBRASKA, January 20, 1890.

*To the Nebraska State Board of Agriculture:* GENTLEMEN — In compliance with your request for bids for the location of the State Fair for the ensuing five years, the city of Hastings, through its Board of Trade, proposes as follows, to wit:

We will furnish by lease to your board, 120 acres of land, located within one mile of the city of Hastings, so situated as to be of value for fair purposes, upon which shall be constructed a good race track, all inclosed with a tight board fence, eight feet high. Said grounds to be accessible to the Burlington & Missouri River, the Northwestern, Missouri Pacific, St. Joe & Grand Island, and Union Pacific railroads, also connected with the city by street-car lines; and to build thereon such buildings as the Board of Managers of the State Fair Association require for the convenience of the said fair, such buildings to include:

One Agricultural hall, 90 x 200 feet; one Horticultural hall, 40 x 300 feet; one Art hall, 40 x 300 feet; one Mercantile hall, 85 x 200; one Fish hall, 40 x 100 feet; one Dairy hall, 40 x 100 feet; one Bee hall, 25 x 100 feet; one Poultry hall, 30 x 100 feet; one Power hall, 40 x 200; President's office, 20 x 30 feet; Board of Managers' office, 20 x 25 feet; Secretary's office, 20 x 50 feet; Treasurer's office, 20 x 25 feet; Palace building, 40 x 60 feet; amphitheater, 32 x 500 feet; 150 speed stalls 10 x 12 feet; 360 horse stalls 6 x 10 feet; 480 cattle stalls 6 x 10 feet, all in barns; 600 pig pens with floors, 100 sheep pens with floor, in open pens; sufficient water-closets, properly distributed.

Sufficient water for the accommodation of the Fair, furnished through not less than four-inch main, connected with the city water system and distributed upon the ground, with hydrants and tanks at such places as the Board of Managers may direct. Also to furnish sufficient hose for connection with such hydrants, to provide absolute fire protection, and to provide such other buildings and improvements as the said Board of Managers shall deem suitable for the accommodation of the said fair.

All improvements and buildings to be planned and designed and located by said Board of Managers. All improvements and buildings to be made and completed and ready to turn over, as contemplated in this proposition, to the said Board of Managers, on or before the 15th of August, 1890.

And we further propose to provide a fund of $2,000 per year, during the said five years, to be known as the improvement fund, to be held subject to the order of said Board of Managers, and to them or for them paid out, as they may direct, each year, in the further improvements or repair of the said grounds.

We also propose that suitable and sufficient side tracks and depot facilities shall be put in and provided to maintain at said grounds, and that all switching of freight, to and from the grounds, of exhibits, shall be at no expense or cost to either the said Fair Association or the exhibitors, and propose to furnish a bond to be approved by said Board of Managers, that this proposition will be carried out.

All of which we most respectfully submit.

HASTINGS BOARD OF TRADE.

J. F. BALLINGER, *Secretary.* By M. L. ELSEMORE, *President.*

HASTINGS, NEBRASKA, January 14, 1890.

*To the Nebraska State Board of Agriculture:* GENTLEMEN—Anticipating the locating of the Nebraska State Fair in the city of Hastings for the next five years, we, the Common Council of said city, in consideration of the benefits derived from such location, do hereby agree and pledge ourselves to connect the grounds upon which said fair is held, with our water system by a pipe not less than four inches in diameter, and to supply through the same all water necessary for the accommodation of said fair, and all at no cost to the State Fair Association.

C. C. RITTENHOUSE,
*President Council.*
C. L. STONE.
T. J. CREETH.
W. M. VASTINE.
J. A. ROSE.
GEO. A. KENT.

HASTINGS, NEBRASKA, January 20, 1890.

THIS AGREEMENT, Made and entered into this 20th day of January, 1890, between the Hastings Mile Track Association, party of the first part, and the Hastings Board of Trade, party of the second part,

WITNESSETH: The said party of the first part hereby agrees to lease to said party of the second part, one hundred and twenty acres of land siturted directly east and adjoining the land owned by the State of Nebraska, and upon which is located the State Insane Asylum, one mile west of the city of Hastings, for the term of five years, for the purpose of holding the Nebraska State Fair thereon. In consideration of this lease, the party of the second part agree to pay the party of the first part the sum of one dollar per year per acre and taxes, provided the State Fair is located in the city of Hastings for the next five years.

WITNESS: A. L. CLARKE,
M. L. ELSEMORE, *President of Mile Track Association.*
*President Hastings Board of Trade.*
JNO. D. RILEY.

## THE OMAHA PROPOSITION.

*To the Nebraska State Board of Agriculture:* The undersigned, on behalf of the city of Omaha, submit the following proposal for the location and holding at Omaha of the Nebraska State Fair for a term of five years beginning in 1890:

To furnish: One hundred acres of land entirely available for fair purposes, graded, to be surrounded with a tight plank or board fence eight feet high, accessible to railroad trains, motor and street cars, with ample supply of water for all fair and fire purposes, and with the following buildings located thereon:

One Agricultural hall, 18,000 square feet.
One Horticultural hall, 12,000 square feet.
One Art hall, 12,000 square feet, floored.
One Mercantile hall, 17,000 square feet, floored.
One Fish hall, 4,000 square feet, floored.
One Dairy hall, 4,000 square feet.
One Bee hall, 2,500 square feet.
One Poultry hall, 3,000 square feet.
One President's office, 600 square feet, floored.
One Board of Managers' office, 450 square feet, floored.
One Secretary's office, 1,000 square feet, floored.
One Treasurer's office, 450 square feet, floored
One Power hall, 8,000 square feet.
One police head-quarters, 1,800 square feet, floored.
Amphitheater, 32x500 feet.
Speed stalls, 120, 10x12, with provisions for thirty more.
Three hundred and sixty horse stalls, 6x10 feet.
Four hundred and eighty cattle stalls, all in barns.
Six hundred pig pens, floored.
One hundred and ten sheep pens, floored, in open barns.
Sufficient water-closets.
Sufficient water-tanks.

Also show rings for horses and cattle, of suitable size; also a first-class race track; also a dining-hall of sufficient capacity to seat one thousand people at one time; also sufficient box-offices for ticket sellers; also sufficient and properly-fenced drive-ways.

All the foregoing buildings to be designed and located under direction of the managers of the State Board of Agriculture, and to be completed and ready to turn over by August 15, 1890.

Also to provide for the running of railroad trains, motor and street cars, to and from the grounds, for the transportation of freight and passengers, and the convenient loading and unloading of same.

All the above buildings, including the fence, to be placed in good condition on each fifteenth day of August during said term of five years, it being stipulated and agreed that said managers of the Nebraska State Fair shall, immediately after each State Fair, clean up the grounds and make good any injury to fence or buildings that may have occurred, except by fire or wind, to said fence and buildings during the occupancy and use thereof for said State Fair.

A bond is hereto attached, guaranteeing the full and faithful performance of the foregoing proposal.

*Omaha, Nebraska, January 20, 1890.*

Thos. Swobe,
D. C. Patterson,
A. Clemens,
*Committee on Behalf of the City of Omaha.*

### BOND FOR STATE FAIR.

We, the undersigned fifty persons, G. M. Hitchcock, R. C. Cushing, Thomas Swobe, John A. McShane, George N. Hicks, H. Kountze, Ben. B. Wood, Lewis L. Reed, Dewey & Stone Furniture Co., G. W. Loomis, Thos. Kilpatrick, F. P. Kirkendall, P. E. Iler, W. J. Broatch, J. H. Millard, A. P. Tukey, J. S. Caulfield, O. M. Carter, Hugh McCaffrey, D. C. Patterson, P. W. English, S. P. Morse, H. W. Yates, C. W. Hamilton, B. F. Smith, George C. Towle, Geo. Paterson, C. B. Kustin, J. E. Morkel, Jno. S. Collins, John L. McCague, L. Mendelssohn, Max Meyer & Bro., John W. Pane, W. L. Selby, E. M. Morseman, W. F. Allen, Harry D. Reed, Eugene F. Seaver, Edward Rosewater, A. Clemens, Euclid Martin, Daniel H. Wheeler, W. N. Nason, R. C. Patterson, M. S. Lindsay, Wm. L. McCague, C. O. Lobeck, C. Hartman, and Arthur S. Potter, of the County of Douglas and State of Nebraska, hereby acknowledge ourselves indebted to the Nebraska State Board of Agriculture in the sum of fifty thousand dollars ($50,000) for the payment of which well and truly to be made, we hereby bind ourselves, not jointly, but each in the sum of one thousand dollars ($1,000) and no more. This obligation to be binding upon the heirs, assigns, executors, administrators, of each of us.

*Omaha, Nebraska, January 20, 1890.*

Now the condition of the above obligation is, that Whereas, The above-mentioned Nebraska State Board of Agriculture did, by its Secretary, Robert W. Furnas, advertise for sealed proposals for "locating the Nebraska State Fair for a term of five years, commencing 1890;" and Whereas,

On behalf of the city of Omaha did submit a proposal for the location and holding at Omaha of the Nebraska State Fair, for a term of five years, beginning in 1890.

Now, if the above-named parties who submitted such bid on behalf of the city of Omaha, Nebraska, shall in all things comply with the proposals by them submitted, or cause the same to be complied with, then this bond shall be void and of no effect, otherwise to be and remain in full force and effect. And it is hereby expressly stipulated that the signees of this bond shall have the sole and only power and authority to select a site in accordance with the annexed proposition, and to manage and control the formation of the company for the purpose of making good the provisions of said proposition and of this bond. Each of said signees to have one vote.

G. M. Hitchcock.
R. C. Cushing.
Thomas Swobe.
John A. McShane.
Geo. N. Hicks.
H. Kountze.
Ben. B. Wood.
Lewis S. Reed.

O. M. Carter.
Hugh McCaffrey.
D. C. Patterson.
P. A. English.
S. P. Morse.
H. W. Yates.
C. W. Hamilton.
B. F. Smith.

DEWEY & STONE FURNITURE CO.
G. W. LOOMIS.
THOMAS KILPATRICK.
F. P. KIRKENDALL.
P. E. ILER.
W. J. BROATCH.
J. H. MILLARD.
A. P. TUKEY.
J. S. CAULFIELD.
W. L. SELBY.
E. M. MORSEMAN, (by W. L. McCague.)
W. F. ALLEN.
HARRY D. REED.
EUGENE F. SEAVER.
EDWARD ROSEWATER, (by W. L. McCague.)
A. CLEMENS.
EUCLID MARTIN.
GEO. C. TOWLE.
GEORGE PATERSON.
C. B. RUSTIN.
J. E. MARKEL.
JOHN S. COLLINS.
JOHN L. MCCAGUE.
L. MENDELSSOHN.
MAX MEYER & BRO.
JOHN W. PAUL.
DANIEL H. WHEELER.
W. N. NASON.
R. C. PATTERSON, (per D. C. P.)
M. S. LINDSAY.
WM. L. MCCAGUE.
C. O. LOBECK.
C. HARTMAN.
ARTHUR S. POTTER, (by W. L. McCague.)

## THE GRAND ISLAND PROPOSITION.

*To the Committee of the State Board of Agriculture for the purpose of securing a location of the State Fair for the ensuing five years.*

WHEREAS, Your public notice in regard to the location of the State Fair for the next ensuing five years, having been brought to the notice of the citizens of the city of Grand Island, Nebraska; and

WHEREAS, A public meeting of the citizens thereof having been called to consider the same, on the 6th day of September, A. D. 1889, the following business, among other, was transacted:

The meeting was called to order by H. J. Palmer, President, and George H. Thummel was selected as Secretary.

The following resolution was unanimously adopted:

*Resolved*, That a committee of five be appointed for the purpose of drafting and submitting a bid or proposition from the citizens of Grand Island, Nebraska, for the purpose of securing the State Fair.

The chairman thereupon appointed the following-named gentlemen: W. H. Platt, W. H. Thompson, C. F. Bentley, C. P. R. Williams, and O. B. Thompson, as such committee, with full power to act in the premises.

GEORGE H. THUMMEL, *Secretary*. H. J. PALMER, *Chairman*.
*Grand Island, September 6, 1889.*

AND WHEREAS, The said committee so as aforesaid selected, having met at the office of Mayor Platt pursuant to call, submit to the State Board of Agriculture the following:

First, The Hall County Agricultural Society have and own in the city of Grand Island one hundred and sixty acres (all under fence) of the finest land and location in the State of Nebraska. This we tender, first, as to the location, having full authority so to do, free of cost for the full term of five years for the State Fair. These grounds are immediately connected with the Union Pacific Railway Company, and the St. Joseph & Grand Island railroad, whose tracks run into the grounds. These grounds are one mile west of the depot of the Union Pacific Railroad Company, the B. & M. Railroad Company, the St. Joe & Grand Island Railroad Company, the Republican Valley Railroad Company, and the Wyoming Central Railroad Company. These grounds are also connected with the depot and city hotels by the street car line, which also runs into the fair grounds, the said street railroad company having abundance of accommodation for all those who wish to ride. Besides this, the city has numerous wheeled vehicles for the transportation of people to and from the grounds to the hotels and resorts in said city.

The improvements now on the fair grounds aforesaid are: a large amphitheater, capable of seating 3,000 people, an Agricultural hall, Floral hall, Horticultural hall, and machinery department, also half mile of stables and stalls for horses and cattle, sheep sheds, swine and poultry houses. We also contemplate building permanent structures of stone and brick of larger dimensions to take the place of the present wooden buildings. And we will place, as per the advertisement, if the fair is located at this point, all the necessary buildings, structures, and accommodations, within reason, that are required of us by the said State Board. And if the bid had pointed out just what buildings, and their size, was required, we would have met the said requirement in this bid, our intention being now in this bid to meet said requirement as to the buildings.

We have on these grounds a half-mile race track in the most complete condition and not excelled in the United States, and contemplate making a mile track next year.

All of said grounds, buildings, improvements, and track, we agree to furnish to the State Board for the said State Fair for the next five years, free of all costs for the use and benefit of said State Fair.

That if this proposition is accepted and the State Fair located at Grand Island, Nebraska, we will furnish any reasonable guarantee for the faithful performance of the same upon the said board designating the said requirements as to the buildings.

W. H. PLATT,
W. H. THOMPSON,
C. F. BENTLEY,
C. P. R. WILLIAMS,
O. B. THOMPSON,
*Committee.*

*Grand Island, Nebraska, September 7, 1889.*

At a mass meeting, called to meet at the opera house, in the city of Grand Island, Nebraska, the 18th day of January, A. D. 1890, for the purpose of considering the State Fair proposition, the following business was transacted:

S. N. Walbach was elected Chairman, and S. J. Bateman, Secretary.

The following resolution was carried unanimously:

WHEREAS, The citizens of the city of Grand Island, Nebraska, met in September last, and a committee was appointed to adopt a proposition to be filed with the State Board of Agriculture, in accordance with the published statement of such board, that bids would be received on the ——— day of September, 1889, up to the hour of said day for the purpose of locating the State Fair for five years, commencing January 1, 1890; that said committee prepared a proposition which was signed by the same committee, and to which this is attached, and filed the same, as required by the said board; *that this proposition was the only bid on file.* Whereupon the said board continued the matter until January 21, 1890, and published for bids, as aforesaid; and

WHEREAS, The citizens of Grand Island and Hall county, and this vicinity, hereby renew this said proposition, with the further information to the State Board of Agriculture, that since the proposition was written and submitted, the B. & M. R. R. Co. have secured the right-of-way of all Hall County Agricultural society, to enter their grounds, and are now building their track from their main line, where it enters the city of Grand Island, to the beet-sugar factory, in said city, and thence on to the line of the Hall county fair grounds, and along the west side of said fair grounds to their main line again; and

WHEREAS, Believing it to be detrimental to the interest of the State Fair that the heretofore system of demanding numerous passes and permits, during the State Fair, by the citizens, merchants, and Agricultural Society, where the same State Fair has been heretofore located, we in this proposition declare that no passes will be asked by our citizens or members of the Hall County Agricultural Society to attend the said fair, if located here: thereupon, be it

*Resolved*, That the original committee of five, who prepared the proposition, be requested to add the proceedings of this meeting to the other proposition, with full power to act in the premises.

*Grand Island, Nebraska, Januarg 18, 1890.*

S. J. BATEMAN, *Secretary.*

S. N. WALBACH, *Chairman.*

## THE COLUMBUS PROPOSITION.

*To the Nebraska State Board of Agriculture:* The citizens of Platte county, Nebraska, whose names are subscribed to the annexed bond, respectfully ask your honorable body to locate the State Fair in said county for the period of five consecutive years, commencing in 1890; and in consideration of your so doing, propose to furnish, provide, and turn over for your use, free of charge, during such period of five years, all the buildings, structures, grounds, equipments, and other things, specified in "Schedule A," attached to said bond; and said bond is hereby tendered to secure the full and faithful performance of this proposition.

KNOW ALL MEN BY THESE PRESENTS: That we, the undersigned residents of Platte county, Nebraska, are held and firmly bound unto the Nebraska State Board of Agriculture in the penal sum of $100,000, for the payment of which well and truly to be made, we do by these presents, bind ourselves, our heirs, executors, and administrators, jointly and severally.

Dated this 2d day of January, 1890.

The conditions of this obligation are such, that whereas, in case the said Nebraska State Board of Agriculture shall locate and hold the State Fair of said State in said Platte county for five consecutive years, commencing in the year 1890, and the citizens of said county, or any corporation or association to be formed by them, shall provide and furnish in due season a suitable site for holding said fairs in said county during said term of five years, and shall seasonably provide and furnish all the buildings, structures, and equipments, mentioned in "Schedule A," which is hereto attached and hereby made a part of this bond, and turn them over to said Board of Agriculture, then these presents to be void; otherwise, to remain in full force and effect.

J. E. NORTH.
M. K. TURNER.
SAM WELCH.
LEONDA GERRARD.
V. H. WEAVER.
LEOPOLD JAEGGI

John Stauffer.
Adolf Jaeggi.
E. D. Fitzpatrick.
C. H. Davis.
O. M. Post.
O. T. Roen.
J. R. Meagher.
M. P. Hurd.
E. O. Wells.
J. H. Wurdeman.
J. E. Hoffman.
Henry Ragatz.
J. H. Galley.
A. J. Whitaker.
B. W. Ellis.
J. N. Heater.
Gus G. Becher.
R. H. Rusche.
David Schupbach.
J. B. Delsman.
S. E. Marty.
David Smith.
G. W. Phillips.
M. Brugger.
E. Pohl.
C. A. Newman.
James Pearsall.
W. A. McAlister.
Harvey Newman.
W. M. Cornelius.
H. S. Hutchins.
R. C. Boyd.
Herman Loscke.
C. A. Lutz.
G. S. Schroeder.
P. W. Henrich.
Carl Rohde.
F. Anderson.
G. W. Hulsh.
Wm. O'Brien.
C. E. Pollock.
W. Whitmoyer.
A. G. Arnold.
J. M. Honahan.
C. B. Stillman.
Frank Rorer
Dr. E. Maeher.
Markus Scherrer.
H. T. J. Hockenberger.
O. S. Baker.
A. Anderson.
Louis Schwarz.
C. E. Early.
Chas. A. Speice.
G. W. Elston.
F. W. Riemer.
S. E. Cushing.
Chas. Schroeder.
C. C. Miller.
Joseph A. Gutzmer.
Abel Coffey.
John Heitkemper.
G. E. Willard.
R. H. Henry.
J. J. Fellman.
Jas. Ruoen
H. Hughes.
Sam'l Schraleck.
John Kottlar.
John Supp.
J. A. Ernst.
S. S. Rickly.
T. W. Weaver.
E. H. Chambers.
F. Brofulmer.
C. H. Sheldon.
George W. Galley.
Dr. J. Chas. Willy.
Albert Klug.
J. P. Abts.
Wm. Becker.
G. W. Bouton.
J. N. Taylor.
Gus. Falbaum.
E. A. Gerrard.
J. N. Kilian.
C. J. Garland.
C. W. Drundley.
L. H. North.
Henry T. Spoerry.
T. Friedhop.
L. Brainutts.
Gerhard Loscke.
Carl Reinke.
Henry M. Winslow.
George Heitkemper.

John Hubell.
Wm. J. Thurston.
W. W. Manington.
Julius Rasmussen.
I. Sibberusen.
J. M. Gondring.
O. S. Nannon.
J. G. Becher.
Will B. Dale.

John Graf.
G. B. Spiece.
W. N. Hensley.
J. F. Schaffrath.
Chas. F. Elcies.
John Stanly.
V. A. Mackin.
W. A. Way.
Jacob Ernst.

### "SCHEDULE A"—ESTIMATE FOR FITTING UP FAIR GROUNDS FOR FIVE YEARS.

One Agricultural hall, 18,000 feet floor space, without floor.

One Art hall, 12,000 feet floor space, with floor, and wall show cases.

One Fine Art hall, and Textile Fabric exhibits.

One Horticultural hall, 12,000 feet of floor space, without floor.

One Mercantile hall, 17,000 feet floor space, with floor.

One Fish building, 4,000 feet floor space, with floor.

One Dairy house, 4,000 feet floor space, without floor.

One Bee house, 2,500 feet floor space, without floor.

One Poultry house, 3,000 feet floor space, without floor.

One President's office, 600 feet floor space, with floor.

One Board of Managers' office, 450 feet floor space, with floor.

One Treasurer's office, 450 feet floor space, with floor.

One Secretary's office, 1,000 feet floor space, with floor.

One Power hall, 8,000 feet floor space, without floor and with power and shafting adequate.

One amphitheater, 500 feet long, and 32 feet wide, seated and roofed.

One hundred and twenty speed stalls, with thirty contingent.

Three hundred and sixty horse stalls; four hundred and eighty cattle stalls; six hundred hog pens; one hundred sheep pens; all in barn form, and under shingle roof.

Water-closets to accommodate say 50,000 people.

Not less than 100 acres inclosed with eight-foot tight board fence, that many acres available.

Standard half-mile race track.

Scales for weighing stock.

Cattle and hog amphitheaters under roof.

Water supply for 2,000 head horses and cattle, 2,500 head hogs, 500 head sheep for sprinkling grounds, drinking, domestic use, fish, and in case of fire, all to be distributed as the Board of Managers may direct.

Two thousand dollars cash, for improvements each year of the five.

Propositions as to accommodations to accompany, from railroads, water-works company, street railways, motors, and other modes of going to and from the fair grounds.

All to be subject to approval of Board of Managers; grounds to be complete and ready for occupancy by 15th of August next preceding fair, and grounds to be cleaned up before and after fair each year.

## THE KEARNEY PROPOSITION.

*Gentlemen of the Nebraska State Board of Agriculture:* The citizens of Kearney, Neb., wish to make the following proposition for the location of the State Fair for the coming five years:

One hundred and sixty acres of land within one mile of the city of Kearney, Neb., bounded on the south by the great B. & M. Railroad Company clipping the south line of the one hundred and sixty acres from east to west; bounded on the north by the grand Union Pacific, clipping the north line from east to west of the entire one hundred and sixty acres. This tract of land is reached from the city by the electric street railway and also by the street horse-car line. There is running water on the grounds in great abundance, fed from living springs.

Also $60,000, which is in bank and subject to the check of R. R. Greer, providing this bid is accepted by your honorable body.

We further agree that we will pay into the treasury of your State Board, one thousand dollars yearly, for the term of five years.

This entire bid is secured by three National banks of the city of Kearney for the faithful performance of same. Yours,

A LARGE NUMBER OF CITIZENS.

## LONG PINE PROPOSITION.

LONG PINE, NEB., January 21, 1890.

*To the President of State Board of Agriculture and Committee on Relocation:* GENTLEMEN — In behalf of Long Pine, Brown county, Nebraska, I desire to submit the following proposition as an inducement for the location of the State Fair for the ensuing five years, 1890, 1891, 1892, 1893, and 1894.

We are a liberal people at Long Pine, and what we have *not* " we give unto thee."

For and in consideration of granting Long Pine the State Fair for the years specified, we, in behalf of the citizens of said town, pledge you the following:

In cash and valuable interests, $5[illegible]0,000; 160 acres of land conveniently located upon which suitable buildings for the holding of fairs will be erected as needed, by our enterprising citizens.

The " Hotel Dioinell " will be set apart from the many others for the special accommodation of the members of the State Board of Agriculture, and the bath house at the " Famous Seven Springs " will be used only for the renovation of said board, and such others as they see fit to invite to participate.

We also offer as a further inducement, a half interest in the " Long Pine Chautauqua," and one half the increase in real estate caused by the location of said fair.

This proposition is made in good faith, with a firm determination to keep and perform the same, should we be honored by the location.

Not having the required bond to file in such cases, I respectfully refer you to Alexander Schlegel, to be found in the land department at the capitol; W. F. Clevenger, County Treasurer of Brown county, who fortunately is in Lincoln, stopping at the Arlington, and others of my acquaintance who may happen to be in the city, all of whom will tell you that what *I pledge* in behalf of my people will be faithfully performed. Respectfully submitted by

C. R. GLOVER,

*Secretary of Brown Co. Agr. Soc., of Long Pine, Neb.*

P. S.—This is not made to trifle with your feelings, but made with a hope that if we are fortunate in procuring the coveted prize, that it will be instrumental in bringing us the B. & M. railroad, that stands at Burwell, a distance of thirty-five miles, staring us in the face, but approaches not.

The following anonymous preamble and resolutions were laid on the Secretary's desk, with request to read, which was done:

WHEREAS, The relocation of the State Fair for the next five years is one of great importance to the people of this State; and

WHEREAS, Deeming it a great necessity that the welfare and interest of all classes be cared for in this relocation, and that the farmer, the stock-raiser, the merchant, mechanic, laboring man, artist, and all representatives of skill and toil, join hand and hand for the future interest of this State; and

WHEREAS, Believing the changing of location every five years is one of great benefit and advantage to the State, and aids to advertise us, and present to the world the great developments of this State as to its Agricultural products, mechanism, fine arts, and stock; and

WHEREAS, The city of Lincoln has had the location for the past five years, during which time the central and western portions of the State have become well settled, railroads have been constructed connecting the North with the South and the East with the West, crossing and recrossing the State in many places, we think it most expedient in the selection of the location for the next five years, to relocate in some other and different place that can provide for this society at least equal facilities and advantages: therefore, be it

*Resolved*, That in locating the State Fair for the next ensuing five years, it be located at some place other than the city of Lincoln, always taking into consideration the location, the advantage to the producer, and the proposition of the bidder.

Milton Doolittle, of Holt county; Frank N. Holt, of Gage county; R. T. McGrew, of Phelps county; were appointed tellers. The first vote resulted:

| | |
|---|---|
| Lincoln | 39 votes. |
| Hastings | 17 votes. |
| Grand Island | 11 votes. |
| Omaha | 8 votes. |
| Columbus | 7 votes. |
| Kearney | 5 votes. |
| Long Pine | 3 votes. |

The second ballot resulted:

| | |
|---|---|
| Lincoln | 56 votes. |
| Hastings | 15 votes. |
| Omaha | 10 votes. |
| Grand Island | 6 votes. |
| Columbus | 2 votes. |

The vote was made unanimous, and the following resolution, by Mr McIntyre, was adopted:

*Resolved*, That the proposition submitted by the Nebraska Exposition Association, Lincoln, for locating the Nebraska State Fair for the years 1890, 1891, 1892, 1893, and 1894, be accepted, and the President and Board of Managers be and are hereby authorized to take such action as may be necessary to protect the interests of this board.

Mr. Wright, from Pawnee county, announced the sudden death, at the railroad depot in Lincoln, of Hon. Samuel Barnard, president of the Pawnee County Agricultural Society, and on his motion, a committee was appointed to draft and report to this meeting resolutions expressive of the sense of this board as to the death of Mr. Barnard.

Messrs. Wright, McIntyre, and Jensen, were appointed said committee, and in due time reported the following, which was adopted unanimously by a rising vote:

"MR. PRESIDENT: In compliance with the resolution of this board, we present the following as a slight token of our respect and esteem for and appreciation of our late associate and member, the Hon. Samuel Barnard, who was so suddenly stricken by death in the city of Lincoln, on January 16, 1890.

"We cannot express the sense of sadness and gloom that the premature death of our long-time friend and member cast over the minds of his associates and friends with whom he had stood shoulder to shoulder for so long a time, as legislator, in social and working circles, in the developing of this his adopted State. He was always to be found at his post of duty, full of good nature and good cheer.

"He was endowed with a warm, cheerful, and genial disposition, that asserted itself at all times; so strong that it always touched a responsive chord. He was a man of strong convictions, but never obtrusive; one who saw the right quickly, and possessed the courage to do it; one firm in his decisions, but never imposing.

"As a mark of respect on the part of the State Board of Agriculture, with which he was long associated, we offer and ask the adoption of the following preamble and resolutions:

"WHEREAS, The long, pleasant, and profitable, association and services of the late Hon. Samuel Barnard, greatly endeared him to the members of the Nebraska State Board of Agriculture; and

"WHEREAS, It has pleased Him, who knoweth all things and doeth all things wisely and for His own purposes, to remove him from our midst; therefore,

"*Resolved*, That in the death of Mr. Barnard this society loses one of its most useful, honored, and valued members, the State one of its best citizens, and the family a kind husband and father of rare merit and worth; thefore

"*Resolved*, That in the published proceedings of this organization, a page appropriately clad in mourning be dedicated to the memory of the late Hon. Samuel Barnard of the Nebraska State Board of Agriculture. And be it further

"*Resolved*, That we hereby tender our heartfelt sympathy to the bereaved family, and that the Secretary be and is hereby instructed to furnish them an engrossed copy of these preambles and resolutions, and that the same be spread upon the records of this board.

"N. S. WRIGHT,
"EDMUND MCINTYRE,
"J. JENSEN,
"*Committee.*"

By vote it was ordered that the Secretary issue warrants in payment of all hotel bills incurred during this meeting, by members in attendance not residents of Lincoln.

Mr. Hughes, from the Committee on Arbor-day Premiums, submitted the following report, which was adopted, and the Secretary directed to not issue warrants in payment of premiums claimed:

"*Hon. State Board of Agriculture:* I respectfully submit the following report on tree planting on Arbor Day:

"1st—It is not clearly shown by applicant for premium that the planting was done on Arbor Day.

"2d—The rules of this class require it to be shown that four-fifths, or eighty per cent, of said trees are alive and in good growing condition on September 15. Applicant only claims seven-tenths, or seventy per cent, in proper condition. Therefore, I respectfully recommend that no premium be given.

"JOHN S. HUGHES,
"*Superintendent.*"

On motion adopted, a Committee of three on resolutions was appointed. The President appointed J. B. Dinsmore, S. C. Bassett, J. S. Hughes.

The Committee in due time reported as follows, and which was adopted:

"*To the State Board:* Your committee on Resolutions submit the following for your consideration:

"*Resolved,* That a committee, not to exceed three in number, be appointed by our President, to act in conjunction with like committees appointed by the State Dairymen's Association, State Horticultural Society, Improved Stock Breeders' Association, farmers institutes, and other like organizations desiring to co-operate, the object being for such committee to formulate and present for the consideration of the members of our next Legislature, a bill for an act to provide for holding farmers' institutes in the various counties of the State.

"WHEREAS, We have heard there was a disposition among certain of our Western Congressmen to encourage the repeal of the "timber-culture" law, on the ground that such law is impracticable, and that the difficulties of successfully planting timber are too great. We would respectfully urge upon them that in the experience of practical foresters of the West, the difficulties of raising timber in any portion of the public domain east of the Rocky mountains are not insuperable when met by painstaking and thorough work and judicious selection of varieties. We urge that the timber-claim law be allowed to remain in force, needing only such judicious amendments as shall make its requirements and conditions more in accord with the original intent of the act.

"*Resolved,* That this board indorse and recommend the passage of what is known as the "Manderson Laboratory Bill" now pending before Congress, and that the Secretary is hereby instructed to furnish the Nebraska Delegation in Congress, each, with a copy of this resolution.

WHEREAS, The live-stock interests of Nebraska are of the greatest importance to the people of the State, and as our owners of live stock suffer more or less each year by reason of diseases among said live stock, be it

*Resolved,* That the Experiment Station of the State of Nebraska will serve the agricultural interests of the State in the highest degree, by continuing, at the earliest date practicable, the investigations in regard to diseases of our domestic animals, so ably conducted by Dr. F. S. Billings; and for the purpose of such investigations, the best talent obtainable should be employed by those having said Experiment Station in charge.

*Resolved,* That Prof. L. E. Hicks be and is hereby appointed geologist for this board, and for the purpose of defraying the incidental expenses connected with his work, the sum of one hundred dollars annually is hereby appropriated out of the funds of this society, and placed at his disposal, for the payment of such expenses.

WHEREAS, The State of Nebraska was by nature intended as an agricultural State, and the agricultural classes have claims to the recognition of the legislative body of the State to advance their interests in every legitimate way: therefore, be it

*Resolved,* That the next Legislature of this State be asked to appropriate the sum of ten thousand dollars, or so much thereof as may be required, to be expended under the direction of the State Board of Agriculture in holding farmers' institutes in the different counties of this State.

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## THIRD DAY.

LINCOLN, January, 23, 1890.

The Board convened, with Vice President McDowell in the chair. On the roll being called, a quorum was found to be present.

Mr. Thomas H. Darnall, on behalf of the Agricultural and Horticultural Associations of Chase county and that part of the State, presented Secretary Furnas with a beautiful floral ship. Mr. Darnall said:

"MR. PRESIDENT: With your permission I desire to interrupt the proceedings for one moment. I have been delegated by some of your friends from the west to present Governor Furnas, on behalf of some of the people who have lived there for a number of years and have watched the growth of this agricultural society, and have known that Governor Furnas for more than a quarter of a century, yea, before this commonwealth was born into the sisterhood of states — that you, Governor Furnas, have watched and cared for the agricultural society of this State and have been one of those who assisted in making it what it is. I say, in behalf of the west, I have been delegated to present this little token of their appreciation for what you have done. [Here a beautiful miniature ship of rare and fragrant flowers was placed in the hands of the Governor.]

"Governor, when troubles overtake you in this work, and annoyances and difficulties would overpower you, remember that though they can give nothing, yet your devotion to the cause is appreciated by the men whose toils are making Nebraska and the West what they are. We know that you grasped this work in its infancy; we realize that you understood the great toil that was before you when Nebraska started out in this work. Looking over her prairies you could say with the poet:

"'Italy, sweet land of song,
Where bards have sung thy beauties, matchless deemed,
Thou hast a rival in this prairie land.'

"Now, Governor, to you, we believe, more than any other one, is due the credit of making the agricultural resources of this State what they are; that you have made this agricultural society what it is to-day; and knowing this fact and appreciating your labors, I wish to present this as a little token for what you have done, and we could say with Whittier:

"'Give fools their gold or knaves their power,
Let Fortune's baubles rise or fall;
Who sows a field, or plants a tree
Or trains a flower, is more than all.'

"And to you, Governor Furnas, on behalf especially of the agricultural and horticultural fair association of Chase county, located at Champion, and the people of the west in general, we present this little token of flowers."

Secretary Furnas said in response:

"MR. PRESIDENT—MR. DARNALL: To say one is taken by surprise on occasions like this, I am aware, would be a 'chestnut' of the ancient order. And really, sirs, in this instance, the surprise is complete. The presentation of this marked recognition and appreciation of my humble services is so entirely unexpected, that I am at a loss for words to appropriately reply. I accept the presentation in the spirit I am confident it is made, and with thanks.

"It has been my peculiar lot, for some cause, I scarcely know why, to have been an active participant in the agricultural development of this State and the territory from its infancy. It was perhaps an accident that threw me into Nebraska originally. When I came, there was but little to encourage any one to remain. We came under the impression that had gone out in all the geographies of that time

— that everything west of the Missouri river was a barren desert — the 'Great American Desert,' to use the oft-repeated expression current at the time. It required a decade — the first ten years of our existence — to satisfy ourselves that there was anything here worth living for. The line of agriculture seemed to have impressed my mind at an early date, and I identified myself with the agricultural interests of the territory. Feeling then, as I still feel, that this is a peculiarly-advantageous agricultural region, and must be developed in that direction, I have labored to the best of my ability to aid in making the State what it is. No more credit, however, is due to me than to others of the early-day pioneers, that Nebraska has attained such a position agriculturally and otherwise as she holds to-day nationally. Again I thank you for this token of respect and confidence."

On motion, $6,000 was placed at the disposal of the Board of Managers, to be used in speed premiums, at the fair, September, 1890.

By vote, the Secretary was directed to have packed and shipped for exhibition at Vienna and Edinburgh, the coming season, the corn exhibit now in place in Grant Memorial hall, and the Board of Managers were authorized to audit and direct paid bills for expense in thus disposing of this exhibit, to include labor, packing, and freight to a point to be agreed upon by the Secretary and the party to whom it may be consigned.

It was ordered that the Secretary have photo. views made of the corn exhibit, to such an extent as may be directed by the Board of Managers, and for such disposition as they may direct.

It was ordered that the Committee on Corn Exhibit report to the Board of Managers, as the report will not be ready before adjournment.

Mr. Jensen, from committee to secure rooms for the State Board of Agriculture in the new State Capitol building, reported as follows, which was adopted:

"MR. PRESIDENT: Your committee to procure rooms in the State Capitol for the use of the State Board of Agriculture, would respectfully report that we have finally succeeded in obtaining suitable quarters, three rooms on the lower floor in the east wing having been assigned for that purpose, one quite large and two smaller ones. The committee would therefore recommend that the Secretary be instructed to remove the books and archives of the board to the quarters so assigned, and that an appropriation not exceeding two hundred dollars be made, to be expended under the direction of the Board of Managers, to suitably furnish at least one of said rooms, as the committee believes that when the Legislature meets, an appropriation can be got to furnish all of said rooms. J. JENSEN."

The following new by-laws were adopted and ordered to take their place in the annually-printed By-Laws and Premium List:

"Under existing State law governing in this case, but one agricultural association can be recognized in one county in the State, and but one representative admitted to a seat and voice in the State Board."

"All officers or members of this board, or other person transacting business of any kind or character for this board, are required to render to the Board of Managers a written, detailed, itemized, report and statement of doings, the same to be filed in the Secretary's office."

"The President is authorized to appoint in advance of the January meeting, a

Committee on Credentials, in order that a report from that committee may be presented at an early hour after the opening of said meeting."

"The President is authorized to appoint in advance of the January meeting, a Committee on the Doings of the Officers, and an Auditing Committee. To the Committee on the Doings of the Officers, may be referred the address of the President, and the general report of the Secretary and Treasurer, for consideration and recommendation, or for subdivision for reference to special committees. To the Auditing Committee may be referred all financial reports of the officers of the Board of Agriculture."

Mr. Wildman moved to pay the claim of one Manning, for services which he claimed to have performed at the State Fair, 1889. After explanations by Dinsmore, Barker, Dunham, and Hughes, by vote, the claim was not allowed.

Peter Youngers jr., on behalf of the State Horticultural Society, presented a plan for the erection of a horticultural hall on fair grounds. Referred to Board of Managers and Nebraska Exposition Association, who are to make the needed improvements on the fair grounds.

I. L. Lyman, President, and J. R. Megahan, Secretary, of the Nebraska State Poultry Association, presented the following petition:

"LINCOLN, January 22, 1890.

"*To the State Board of Agriculture:* GENTLEMEN—The Nebraska State Poultry and Pet Stock Association, at a recent meeting of its Executive Committee, held in this city, decided to ask your honorable board for an appropriation of $100 to assist our Association in offering suitable premiums and defraying necessary expenses in connection with our regular annual exhibit to be held February 4-8, 1890, at Lincoln. Respectfully, I. L. LYMAN,
*President.*

"J. R. MEGAHAN,
"*Secretary.*"

On motion of Mr. McIntyre, an appropriation of $100 was made for the State Poultry Association, and the Secretary directed to issue a warrant for that sum.

On motion of Mr. Grennell, all improvements on the fair grounds are to be made under the agreement of the Nebraska Exposition Association, to be subject to the dictation and approval of the Board of Managers.

## MILK AND BUTTER TESTS.

The following is the report of the Committee on Milk and Butter Tests, Nebraska State Fair, Lincoln, September, 1889.

| NAME OF OWNER. | ADDRESS. | *Name of Cow.* | *Breed.* | *Age* | *Weight* | *Day since calving* | *Date of test.* | *Number of Pounds and ounces of milk at each milking.* | | | | *Per cent of butter fat in milk.* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Noon | Night | Morning | Total | Noon | Night | Morning |
| O. Compton | Bennett, Neb. | Nip | Jersey | 3 | 720 | 40 | Sept. 11 | ........ | 11- 4 | 11-12 | 23 | ...... | 4.00 | 4.00 |
| | | | | | | | Sept. 12 | ........ | 11- 5 | 11- 6 | 22-11 | ...... | 5.25 | 4.50 |
| | | | | | | | Sept. 13 | ........ | 9-11 | 11- 2 | 20-13 | ...... | 4.00 | 6.00 |
| M. E. Moore | Cameron, Mo. | Empress Josephine 3d | Holstein | 4 | 1250 | 90 | Sept. 11 | 17- 6 | 17- 5 | 24-12 | 59- 7 | 3.00 | 3.50 | 3.00 |
| | | | | | | | Sept. 12 | 15- 7 | 23- 8 | 25- 8 | 64- 7 | 3.50 | 2.50 | 2.50 |
| | | | | | | | Sept. 13 | 19-13 | 13-13 | 23-10 | 57- 4 | 2.00 | 3.00 | 3.00 |
| M. E. Moore | Cameron, Mo. | Hortense | Holstein | 4 | 1150 | 1.0 | Sept. 11 | 13-12 | 13- 9 | 21-12 | 49- 1 | 3.00 | 3.25 | 3.00 |
| | | | | | | | Sept. 12 | 13- 4 | 12-14 | 19- 6 | 45- 8 | 3.75 | 2.50 | 3.25 |
| | | | | | | | Sept. 13 | 16-10 | 9- 9 | 18- 3 | 44- 6 | 3.00 | 2.50 | 4 00 |
| Geo. B. French | Fremont, Neb. | Katrine | Jersey | 6 | 760 | 90 | Sept. 11 | ........ | 8- 2 | 8 | 16- 2 | ...... | 4.00 | 3.00 |
| | | | | | | | Sept. 12 | ........ | 8-13 | 8-14 | 17-11 | ...... | 4.25 | 4.25 |
| | | | | | | | Sept. 13 | ........ | 8- 4 | 9- 7 | 17-11 | ...... | 2.25 | 5.50 |
| A. Palmer | Lincoln, Neb. | Blanch S. | Holstein | 3 | 980 | 30 | Sept. 11 | 15- 6 | 13- 4 | 20 | 48-10 | 2.00 | 2.25 | 2.00 |
| | | | | | | | Sept. 12 | 11- 6 | 12- 5 | 18-15 | 43-10 | 1.75 | ...... | ...... |
| | | | | | | | Sept. 13 | 16-11 | 11- 8 | 19- 3 | 47- 6 | 2.50 | 2.00 | 2.25 |
| Home Farm Fine Stock Co. | Hampton, Ia. | Jewell | Holstein | 11 | 1320 | 160 | Sept. 11 | 18- 5 | 17- 9 | 25-13 | 61-11 | 3.00 | 3.50 | 3.00 |
| | | | | | | | Sept. 12 | 15-15 | 16 | 25- 2 | 57- 1 | 3.75 | 3.00 | 3.00 |
| | | | | | | | Sept. 13 | 19- 9 | 16- 2 | 26- 7 | 62- 2 | 3.00 | 3.00 | 2.75 |
| Home Farm Fine Stock Co. | Hampton, Ia. | Rijaneta | Holstein | 9 | 1310 | 65 | Sept. 11 | 22 | 19- 2 | 27- 8 | 68- 5 | 3.00 | 3.25 | 3.50 |
| | | | | | | | Sept. 12 | 15-12 | 14-15 | 23-15 | 54-10 | 4.25 | 2.00 | 2.25 |
| | | | | | | | Sept. 13 | 22- 4 | 14- 6 | 27- 3 | 63-13 | 4.00 | 3.00 | 3.00 |
| Home Farm Fine Stock Co. | Hampton, Ia. | Jewell 2d | Holstein | 9 | 1160 | 195 | Sept. 11 | 15 | 14-11 | 22-14 | 52- 9 | 3.00 | 3.50 | 3.00 |
| | | | | | | | Sept. 12 | 12-10 | 15 | 21-12 | 49- 6 | 3.25 | 3.00 | 1.75 |
| | | | | | | | Sept. 13 | 17-11 | 11- 8 | 21-14 | 51- 1 | 2.00 | 4.25 | 3.00 |

## MILK AND BUTTER TESTS — CONCLUDED.

| NAME OF OWNER. | ADDRESS. | *Name of Cow.* | *Breed.* | *Age* | *Weight* | *Days since calving* | *Date of Test.* | *Total pounds butter fat each day* | *Total pounns butter fat for three days* | *Total solids in night's milk Sept. 11* | *The daily feed of each cow was all the clover and timothy hay she would eat, and the following additional rations, expressed in pounds, grain all ground.* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Oats | Cornmeal | Bran | Shorts | Oil meal | Cotton-seed meal | Rye | Beets | Turnips | Corn fodder |
| O. Compton | Bennett, Neb. | Nip | Jersey | 3 | 720 | 40 | Sept. 11 | .92 | | 14.28 | 9 | | | | | | 5½ | | | 1 bu |
| | | | | | | | Sept. 12 | 1.10 | | | | | | | | | | | | |
| | | | | | | | Sept. 13 | 1.06 | 3.08 | | | | | | | | | | | |
| M. E. Moore | Cameron, Mo. | Empress Josephine 3d, | Holstein | 4 | 1250 | 90 | Sept. 11 | 1.86 | | 12.29 | 8 | 4 | 6 | | | 3 | | 8 | | |
| | | | | | | | Sept. 12 | 1.77 | | | | | | | | | | | | |
| | | | | | | | Sept. 13 | 1.52 | 5.15 | | | | | | | | | | | |
| M. E. Moore | Cameron, Mo. | Hortense | Holstein | 4 | 1150 | 120 | Sept. 11 | 1.51 | | 13.02 | 10 | 5 | 6 | | | | | | 12 | |
| | | | | | | | Sept. 12 | 1.45 | | | | | | | | | | | | |
| | | | | | | | Sept. 13 | 1.47 | 4.43 | | | | | | | | | | | |
| Geo. B. French | Fremont, Neb. | Katrine | Jersey | 6 | 760 | 90 | Sept. 11 | .57 | | 14.03 | | | | | | | | | | |
| | | | | | | | Sept. 12 | .75 | | | | | | | | | | | | |
| | | | | | | | Sept. 13 | .71 | 2.03 | | | | | | | | | | | |
| A. Palmer | Lincoln, Neb. | Blanch S. | Holstein | 3 | 980 | 30 | Sept. 11 | 1.01 | | 11.20 | 12 | | 6 | 3 | | | | 6 | | 6lbs |
| | | | | | | | Sept. 12 | .20 | | | | | | | | | | | | |
| | | | | | | | Sept. 13 | 1.08 | 2.29 | | | | | | | | | | | |
| Home Farm Fine Stock Co. | Hampton, Ia. | Jewell | Holstein | 11 | 1320 | 160 | Sept. 11 | 1.93 | | 12.39 | 7½ | 7½ | 12 | | 1 | | | | | |
| | | | | | | | Sept. 12 | 1.83 | | | | | | | | | | | | |
| | | | | | | | Sept. 13 | 1.80 | 5.56 | | | | | | | | | | | |
| Home Farm Fine Stock Co. | Hampton, Ia. | Riajaneia | Holstein | 9 | 1310 | 65 | Sept. 11 | 2.23 | | 11.33 | 7½ | 7½ | 12 | | 1 | | | | | |
| | | | | | | | Sept. 12 | 1.51 | | | | | | | | | | | | |
| | | | | | | | Sept. 13 | 2.14 | 5.88 | | | | | | | | | | | |
| Home Farm Fine Stock Co. | Hampton, Ia. | Jewell 2d | Holstein | 9 | 1160 | 195 | Sept. 11 | 1.65 | | 12.01 | 7½ | 7½ | 12 | | 1 | | | | | |
| | | | | | | | Sept. 12 | 1.24 | | | | | | | | | | | | |
| | | | | | | | Sept. 13 | 1.50 | 4.39 | | | | | | | | | | | |

The test was for three days. The milking was all done in the presence of the committee, and the milk at once weighed and samples taken for analysis.

The per cent of butter fat was determined by Short's method.

The total solids of the night's milking of September 11th was determined by Prof. Elton Fulmer, of the Nebraska experiment station.

The feeding of the cows was not under the control of the testing committee, and the kind and quantity of food consumed by the cows, as appears in the accompanying table, is from the statements of those in charge of the cows. It will be noticed that no butter fat is credited to the cow Blanche S, for her night's and morning's milk of September 12. Not a trace of butter fat appeared in the samples of milk taken from those two milkings, although treated the same as other samples. This cow was evidently out of condition, her owner stating that she had been overfed just before the commencement of the test.

No statement of the food consumed by the cow Katrine was furnished the committee. The awards of premiums in Class B, Lot 12, were as follows:

*Cows Four Years Old and Over.*—First premium, Holstein cow Rijaneta, who gave in three days 186 lbs. 12 oz. milk, containing 5.88 lbs. butter fat; 2d premium, Holstein cow Jewell, whose record for three days was 180 lbs. 14 oz. milk, containing 5.56 lbs. butter fat.

*Cows Three Years Old and Under Four.*—First premium, Jersey cow Nip, whose record for three days was 166 lbs. 8 oz. milk, containing 3.08 lbs. butter fat; 2d premium, Holstein cow Blanche S., whose record for three days was 139 lbs. 10 oz. milk, containing 2.29 lbs. butter fat.

## WINTER CORN EXHIBIT, JANUARY 21, 1890.

**The Committee on Corn Exhibit submits the following report:**

| EXHIBITORS. | *Average length of ear, inches* | *Average circumference of ear, inches* | *Per cent of clear grain to ear* | *Length of kernel, inches* | *Weight of one bushel of shelled corn* | *Score on a basis of 1,600 points* | *Color of cob.* | *Premium* |
|---|---|---|---|---|---|---|---|---|
| *Large Yellow Dent.* | | | | | | | | |
| M. H. Smith, De Soto | 9.33 | 6.92 | 90.70 | ½ | 57.25 | 1465 | dark red | 1st |
| Fred Bingham, Lincoln | 9.92 | 7.08 | 83.70 | ½ | 56.00 | 1447 | dark red | 2d |
| Harry Seltz, De Soto | 10.25 | 6.62 | 85.40 | 7-16 | 57.75 | 1446 | red or w | ...... |
| Wm. M. Gilmore, Fairbury | 10.12 | 7.60 | 86.00 | ½ | 54.50 | 1432 | pink | ...... |
| George A. Slayton, Salem | 10.42 | 7.29 | 86.00 | 9-16 | 53.25 | 1424 | dark red | ...... |
| R. Hogue, Crete | 10.00 | 7.87 | 82.70 | ½ | 55.75 | 1420 | white or r | ...... |
| I. M. Wilde, De Soto | 9.75 | 6.50 | 83.11 | ½ | 57.00 | 1410 | dark red | ...... |
| N. P. Jensen, Lincoln | 9.92 | 7.50 | 85.30 | 7-16 | 54.50 | 1408 | white or r | ...... |
| J. D. Woods, Lincoln | 9.41 | 7.60 | 82.84 | 9-16 | 55.25 | 1395 | dark red | ...... |
| Wm. H. Outt, Lincoln | 10.08 | 7.25 | 84.00 | 9-16 | 57.00 | 1392 | pink | ...... |
| Wm. T. Ernst, Columbus | 10.50 | 7.33 | 84.40 | 9-16 | 54.75 | 1389 | red | ...... |
| John McNelly, Tamora | 11.45 | 6.75 | 89.70 | ½ | 55.25 | 1386 | pink | ...... |
| A. Greenameyer, Cheney | 10.25 | 7.25 | 85.50 | ½ | 54.00 | 1384 | pink or red | ...... |
| *Small Yellow Dent — "Mammoth Cuban."* | | | | | | | | |
| John Sigerson, Brownville | 8.66 | 7.00 | 87.20 | 9-16 | 57.50 | 1505 | dark red | 1st |
| M. H. Smith, De Soto | 8.17 | 6.40 | 87.60 | ½ | 57.50 | 1474 | light red | 2d |
| Smith Bros., Malcolm | 8.75 | 6.08 | 86.00 | 9-16 | 54.25 | 1464 | red | ...... |
| A. P. Seymour, Unadilla | 6.92 | 6.25 | 89.50 | ½ | 58.50 | 1446 | dark red | ...... |
| C. D. Shrader, Logan | 8.33 | 7.25 | 83.00 | ½ | 54.25 | 1432 | light red | ...... |
| Beverly E. Waugh, Denton | 8.33 | 6.33 | 86.00 | 7-16 | 56.75 | 1423 | dark red | ...... |
| C. M. Thomas, Chapman | 8.08 | 5.80 | 82.00 | 7-16 | 57.25 | 1407 | pink or w | ...... |
| Lee Smith, De Soto | 8.08 | 6.66 | 86.40 | ½ | 55.50 | 1460 | pink | ...... |
| J. D. Ream, Broken Bow | 8.50 | 6.62 | 85.00 | ¼ | 56.75 | 1351 | pink | ...... |
| C. M. Thomas, Chapman | 8.50 | 6.75 | 84.30 | 7-16 | 56.50 | 1251 | red | ...... |
| W. W. Cowles, Thedford | 7.50 | 6.12 | 79.00 | 7-16 | 45.66 | 1182 | white or p | ...... |
| *Large White Dent.* | | | | | | | | |
| George A. Slayton, Salem | 10.82 | 7.50 | 84.60 | ⅝ | 53.25 | 1474 | white | 1st |
| Lee Smith, De Soto | 9.92 | 7.33 | 85.60 | ½ | 56.76 | 1471 | white | 2d |
| M. Dunn, Papillion | 9.50 | 7.25 | 84.70 | ½ | 57.00 | 1448 | red or w | ...... |
| J. D. Woods, Lincoln | 9.75 | 7.87 | 84.70 | ⅝ | 55.00 | 1446 | red or w | ...... |
| John Sigerson, Brownville | 9.50 | 6.81 | 85.80 | ½ | 56.50 | 1436 | white | ...... |
| George A. Slayton, Salem | 9.17 | 7.75 | 80.70 | ⅝ | 53.25 | 1434 | red | ...... |
| S. R. Hall, Waverly | 9.33 | 7.04 | 83.00 | ½ | 55.00 | 1420 | white | ...... |
| W. P. Higgins, Wescott | 9.33 | 6.25 | 83.00 | 7-16 | 57.00 | 1376 | white | ...... |
| *Small White Dent.* | | | | | | | | |
| Lee Smith, De Soto | 8.66 | 6.56 | 87.70 | 9-16 | 56.00 | 1475 | white | 1st |
| M. H. Smith, De Soto | 8.25 | 6.75 | 84.80 | ½ | 57.00 | 1451 | white | 2d |
| J. D. Ream, Broken Bow | 8.50 | 6.62 | 77.30 | 7-16 | 57.25 | 1385 | red or w | ...... |
| W. W. Cowles, Thedford | 8.17 | 5.50 | 81.00 | ⅜ | 53.75 | 1229 | pink or w | ...... |
| *Mixed Dent.* | | | | | | | | |
| N. Cachlin, De Soto | 10.17 | 6.62 | 88.00 | ½ | 55.50 | 1443 | red | 1st |
| J. D. Ream, Broken Bow | 8.25 | 6.75 | 84.00 | ½ | 58.00 | 1415 | red | 2d |
| Eagle Bros., Kearney | 9.00 | 6.75 | 86.60 | ½ | 58.00 | 1403 | red | ...... |
| J. D. Ream. Broken Bow | 9.17 | 6.50 | 85.00 | ¼ | 57.25 | 1399 | white or r | ...... |
| John W. Hawkins, Minden | 9.80 | 6.25 | 85.00 | 7-16 | 56.25 | 1398 | red | ..... |
| *Calico.* | | | | | | | | |
| Geo. A. Slayton, Salem | 10.00 | 7.33 | 84.00 | 9-16 | 56.00 | 1456 | red or w | 1st |
| M. H. Smith, De Soto | 10.00 | 7.00 | 83.00 | ½ | 57.25 | 1446 | red or w | 2d |
| Lee Smith, De Soto | 9.00 | 6.84 | 82.50 | ½ | 56.50 | 1440 | red or w | ...... |
| Fred Bingham, Lincoln | 9.25 | 6.87 | 84.70 | ½ | 57.00 | 1430 | pink | ...... |
| M. Dunn, Papillion | 9.50 | 7.00 | 83.50 | ½ | 59.25 | 1424 | pink | ...... |
| J. D. Woods, Lincoln | 10.25 | 7.62 | 80.60 | 9-16 | 53.00 | 1420 | red or w | ...... |
| J. D. Ream, Broken Bow | 9.00 | 7.00 | 83.00 | ½ | 59.25 | 1414 | pink | ...... |
| Harry Seltz, De Soto | 9.00 | 6.50 | 81.00 | ½ | 55.75 | 1405 | pink | ...... |

WINTER CORN EXHIBIT—CONCLUDED.

| EXHIBITORS. | Average length of ear, inches......... | Average circumference of ear, inches ......... | Per cent of clear grain to ear......... | Length of kernel, inches, | Weight of one bushel of shelled corn......... | Score on a basis of 1,600 points......... | Color of cob. | Premium......... |
|---|---|---|---|---|---|---|---|---|
| J. D. Ream, Broken Bow | 9.00 | 6.75 | 80.00 | ½ | 56.00 | 1380 | pink | ...... |
| *Hackberry Dent.* | | | | | | | | |
| C. B. Smith, Blair | ......... | ......... | ......... | ......... | ......... | ......... | ......... | 1st |
| *Named Strains of Yellow Dent.* | | | | | | | | |
| R. Hogue, Crete, Hogue's Dent | 10.00 | 7.04 | 90.50 | ⅝ | 55.25 | 1488 | red | 1st |
| Lee Smith, De Soto, Smith's Dent, | 8.84 | 6.75 | 88.00 | 9-16 | 57.00 | 1482 | red | 2d |
| Wm. Troyer, Dorchester, Hogue's Dent | 8.83 | 7.54 | 84.00 | ⅝ | 56.75 | 1448 | red | ...... |
| Smith Bros., Malcolm, Golden Beauty | 9.66 | 6.50 | 83.00 | 9-16 | 56.00 | 1440 | pink | ...... |
| Pat Murray, Blair, Golden Beauty, | 10.66 | 9.62 | 83.00 | ⅝ | 53.00 | 1435 | white to r. | ...... |
| B. E. Waugh, Denton, Leaming | 9.08 | 6.20 | 86.60 | ½ | 55.50 | 1482 | red | ...... |
| S. Huddleson, Blair, Clark's Mastodon | 9.33 | 7.87 | 84.30 | 9-16 | 53.00 | 1419 | dark red | ...... |
| *Named Strains of White Dent.* | | | | | | | | |
| M. H. Smith, De Soto, Smith's Dent | 9.12 | 7.00 | 87.50 | 9-16 | 55.94 | 1459 | white | 1st |
| H. C. Taylor, Nemaha county, Triple | 7.84 | 6.00 | 90.70 | 9-16 | 58.00 | 1452 | white | 2d |
| John Sigerson, Brownville, Hickory King | 8.50 | 6.00 | 88.80 | ⅝ | 54.75 | 1448 | white | ...... |
| *Sugar Corn.* | | | | | | | | |
| O. Nelson, Richland | 8.75 | 6.50 | 78.60 | ½ | 48.00 | 1426 | white | 1st |
| A. P. Seymour, Unadilla | 6.57 | 7.00 | 76.00 | 7-16 | 48.25 | 1408 | white | 2d |
| John Sigerson, Brownville | 8.50 | 6.12 | 84.00 | ½ | 44.00 | 1403 | white | ...... |
| J. W. Hawkins, Minden | 8.25 | 6.75 | 81.00 | 9-16 | 43.25 | 1400 | white | ...... |
| O. Nelson, Richland | 9.58 | 6.75 | 77.00 | ½ | 48.75 | 1388 | white | ...... |
| John Sigerson, Brownville | 7.00 | 4.62 | 84.60 | ⅜ | 51.00 | 1377 | dirty white | ...... |

POP CORN.—John Sigerson, Brownwille, (Golden Tom Thumb,) 1st; Bud Jones, Blair, (Queen's Golden,) 2d.

The following gentlemen also had exhibits of pop corn: George A. Slayton, Salem; S. R. Hall, Waverly; John Sigerson, Brownville; Bud Jones, Blair; Wm. Newell, Blair; John W. Hawkins, Minden; Beverly E. Waugh, Denton; Wm. Troyer, Dorchester; John Sigerson, Brownville.

*Discretionary*—George A. Slayton, Salem, Early Red Dent.

YELLOW FLINT.—John Sigerson, Brownville, first premium.

R. W. Blake, Long Pine, white corn grown on sand, diploma.

Largest number varieties, best and best-displayed collective exhibit of corn by any one county in Nebraska, west of the 100th meridian, Logan county, forty-two varieties, 1st, $25; Red Willow county, forty varieties, 2d, $15.

Largest number varieties, best, and best-displayed collective exhibit of corn by any one individual from any section of the State: John Hawkins, (sixteen varieties,) 1st, $25; George A. Slayton, 2d, $15.

The premiums in all classes, except county and individual collective exhibits, were $10 for the first, and $5 for the second. The table as above is arranged to show the relative score of each exhibit.

The score of points, as provided in the premium list was:

### SCORE OF POINTS FOR EAR CORN.

| | |
|---|---|
| Length of ear | 100 |
| Circumference of ear | 100 |
| Evenness of ear | 100 |
| Per cent of net grain to cob | 300 |
| Color and uniformity of grain | 200 |
| Quality and ripeness of grain | 100 |
| Weight of net grain compared with legal standard | 100 |

### SCORE OF POINTS FOR SHELLED CORN.

| | |
|---|---|
| Weight, ⅛ bushel, as a per cent of whole bushel | 200 |
| Color | 100 |
| Market condition | 100 |
| Length of grain | 100 |
| Ripeness | 200 |
| Quality, starchy, chaffy, floury | 200 |

The committee scored on a basis of 1,600 points. The "weight of net grain compared with legal standard," and "quality, (starchy, chaffy, floury,)" were omitted as being impracticable. We called ten inches the standard of length for all large dents; and eight and one-half inches for all small dents. Seven inches as the circumference of large dents, and six and one-half inches for the small dents. For length of kernel, we took Prof. Burrill's standard of five-eighths of an inch.

JARED G. SMITH,
A. M. TROYER,
*Committee.*

Following is the invoice of Nebraska-grown-corn shipment, made to Chas. J. Murphy, Esq., for exhibition at Vienna and Edinburg, the exhibit of January, 1890:

*Box No. 1 contains:*

J. D. Ream, Broken Bow, Custer county, 12 ears calico dent.
J. D. Ream, Broken Bow, Custer county, 16 ears white dent.
J. D. Ream, Broken Bow, Custer county, 15 ears calico dent.
J. D. Ream, Broken Bow, Custer county, 16 ears yellow dent.
J. D. Ream, Broken Bow, Custer county, 13 ears calico dent.
J. D. Ream, Broken Bow, Custer county, 13 ears mixed dent.
C. M. Thomas, Chapman, Merrick county, 21 ears small yellow dent.
W. W. Cowles, Thedford, Thomas county, 32 ears small yellow dent.
Nebraska Experiment Station, Lincoln, 18 ears small yellow dent.

*Box No. 2 contains:*

Geo. A. Slayton, Salem, Richardson county, 18 ears pop corn.
Wm. Gilmore, Fairbury, Jefferson county, 17 ears large yellow dent.
Red Willow county collective exhibit, (in part.)

*Box No. 3 contains:*

Red Willow county exhibit, (in part.)
A. Greenameyer, Cheney, Lancaster county, 14 ears large yellow dent.
J. D. Woods, Lincoln, Lancaster county, 19 ears pop corn.
J. D. Woods, Lincoln, Lancaster county, 19 ears pop corn.
J. D. Woods, Lincoln, Lancaster county, 17 ears large white dent.

*Box No. 4 contains:*

J. D. Woods, Lincoln, Lancaster county, 22 ears large yellow dent.
J. D. Woods, Lincoln, Lancaster county, 4 ears large white dent.
J. D. Woods, Lincoln, Lancaster county, 2 ears large calico dent.
Geo. A. Slayton, Salem, Richardson county, 3 ears sweet corn.
Geo. A. Slayton, Salem, Richardson county, 15 ears large white dent.
Geo. A. Slayton, Salem, Richardson county, 14 ears calico dent.
Geo. A. Slayton, Salem, Richardson county, 13 ears large yellow dent.
Geo. A. Slayton, Salem, Richardson county, 12 ears large white dent.
Geo. A. Slayton, Salem, Richardson county, 16 ears golden pop corn.
Geo. A. Slayton, Salem, Richardson county, 17 ears silver-laced pop corn.

*Box No. 5 contains:*

Geo. A. Slayton, Salem, Richardson county, 33 ears early red dent.
Geo. A. Slayton, Salem, Richardson county, 12 ears sweet corn.
Geo. A. Slayton, Salem, Richardson county, 15 ears large white dent.
Geo. A. Slayton, Salem, Richardson county, 8 ears calico.
Geo. A. Slayton, Salem, Richardson county, 17 ears large yellow dent.
John W. Hawkins, Minden, Kearney county, 10 ears large yellow dent.
John W. Hawkins, Minden, Kearney county, 18 ears pop corn.

*Box No. 6 contains:*

John Hawkins, Minden, Kearney county, individual collective exhibit.

*Box No. 7 contains:*

John Hawkins, Minden, Kearney county, individual collective exhibit.
Nebraska Experiment Station, Lincoln, three kinds of pop corn.

*Box No. 8 contains:*

Wm. L. Ernst, Columbus, Platte county, 15 ears large yellow dent.
Mr. Outt, Lincoln, Lancaster county, 20 ears large yellow dent.
Smith Bros., Malcolm, Lancaster county, 13 ears Golden Beauty dent.
Smith Bros., Malcolm, Lancaster county, 16 ears large yellow dent.
Experiment Station corn, (in part.)

*Box No. 9 contains:*

N. P. Jensen, Lincoln, Lancaster county, 16 ears large yellow dent.
Gosper county, 30 ears yellow and white dent.
Logan county exhibit, (in part.)

*Box No. 10 contains:*

Logan county collective exhibit.

*Box No. 11 contains:*

John Sigerson, Brownville, Nemaha county, 21 ears large white dent.
John Sigerson, Brownville, Nemaha county, 35 ears Hickory King white dent.
John Sigerson, Brownville, Nemaha county, 24 ears Mammoth Cuban.
John Sigerson, Brownville, Nemaha county, 28 ears sugar corn.
John Sigerson, Brownville, Nemaha county, 60 ears pop corn.

*Box No. 12 contains:*

Eagle Bros., Kearney, Buffalo county, 17 ears mixed dent.
Fred Bingham, Lincoln, Lancaster county, 9 ears large yellow dent.
W. P. Higgins, Wescott, Custer county, 18 ears large white dent.
M. Dunn, Papillion, Sarpy county, 11 ears calico dent.
Fred Bingham, Lincoln, Lancaster county, 10 ears calico dent.
M. Dunn, Papillion, Sarpy county, 12 ears large white dent.
Wm. Troyer, Dorchester, Saline county, 14 ears pop corn.
Wm. Troyer, Dorchester, Saline county, 15 ears large yellow dent.

*Box No. 13 contains:*

Samuel Huddleson, Blair, Washington county, 18 ears Early Mastodon.
A. P. Seymour, Unadilla, Otoe county, 15 ears Pride of the North.
Willard Newell, Blair, Washington county, 15 ears pop corn.
A. P. Seymour, Unadilla, Otoe county, 15 ears sugar corn.
Budd Jones, Blair, Washington county, 9 ears blue pop corn.
Pat Murray, Blair, Washington county, 24 ears Golden Beauty.
Budd Jones, Blair, Washington county, 24 ears Queen's Golden pop corn.

*Box No. 14 contains:*

M. H. Smith, De Soto, Washington county, 15 ears small white dent.
B. E. Waugh, Denton, Lancaster county, 16 ears small yellow dent.
B. E. Waugh, Denton, Lancaster county, 17 ears small Early Leaming.
B. E. Waugh, Denton, Lancaster county, 15 ears pop corn, (Queen's Golden.)
I. M. Wilde, De Soto, Washington county, 11 ears large yellow dent.
I. M. Wilde, De Soto, Washington county, 12 ears pop corn.
Lee Smith, De Soto, Washington county, 17 ears small white dent.
Lee Smith, De Soto, Washington county, 15 ears small yellow dent
J. S. Lewis, Wheeler, Wheeler county, 15 ears small yellow dent.

*Box No. 15 contains:*

O. Nelson, Richland, Colfax county, 15 ears sugar corn.
U. Cachlin, De Soto, Washington county, 14 ears mixed dent.
O. Nelson, Richland, Colfax county, 10 ears sugar corn.
M. H. Smith, De Soto, Washington county, 13 ears large yellow dent.
Lee Smith, De Soto, Washington county, 17 ears calico dent.
H. C. Taylor, McKissick Island, Nemaha county, 14 ears triple white dent.
R. Hogue, Crete, Saline county, 15 ears Hogue's yellow dent.
Lee Smith, De Soto, Washington county, 16 ears small yellow dent.

*Box No. 16 contains:*

Harry Seltz, De Soto, Washington county, 18 ears large yellow dent.
Harry Seltz, De Soto, Washington county, 15 ears common red.
M. H. Smith, De Soto, Washington county, 17 ears calico dent.
R. Hogue, Crete, Saline county, 16 ears large yellow dent.
C. B. Seltz, De Soto, Washington county, 20 ears hackberry dent.

*Box No. 17 contains:*

Lee Smith, De Soto, Washington county, 11 ears large white dent.

M. H. Smith, De Soto, Washington county, 16 ears small yellow dent.
M. H. Smith, De Soto, Washington county, 15 ears Smith's white dent.
R. W. Blake, Bassett, Rock county, 22 ears large white dent.

*Box No. 18 contains:*

Six full sets of photo views of the Nebraska Corn Exhibit, Lincoln, January, 1890.
John Sigerson, Brownville, Nemaha county, 12 ears Indian Mandan corn.
Twelve small ears of pop corn, mounted with pins and ribbons, as State Fair souvenirs, 1889.
Lee Smith, De Soto, Washington county, 11 ears large yellow dent.
M. H. Smith, De Soto, Washington county, 16 ears small yellow dent.
M. H. Smith, De Soto, Washington county, 15 ears Smith's White dent.
R. W. Blake, Bassett, Rock county, 22 ears large white dent.

Mr. McIntyre having made known his desire to be relieved from further active duties as a member of the Board of Managers, Mr. Jensen presented the following preambles and resolutions, which were unanimously adopted:

WHEREAS, Edmund McIntyre, for years past a member of the Board of Managers Nebraska State Board of Agriculture, at his own solicitation retires from the active work of that body; and

WHEREAS, It is understood that his declining to further serve in this capacity is by reason of long-continued affliction in his family, requiring undivided personal attention on his part; and

WHEREAS, He has for the past seventeen years been a member of the State Board, two years its President, eleven years member of the Board of Managers, and four years chairman of the same: therefore,

*Resolved*, That in the retirement of Edmund McIntyre this Board loses one of its most active and useful members.

*Resolved*, That the sympathy of this Board is sincerely extended to Mr. McIntyre in his family affliction.

*Resolved*, That the thanks of the Board be extended him for his past efficient services, and that our earnest solicitations are ever with him for his future welfare.

*Resolved*, That the Secretary be and is hereby directed to furnish said Edmund McIntyre with an engrossed copy of these preambles and resolutions.

On explanation of Mr. Macfarland, Superintendent of Speed, Fair 1889, the suspension of Charles McCormick and his horse was declared a mistake, and by vote of the Board removed. The Secretary was directed to so advise the Secretary of the American Trotting Association.

On vote, the Secretary was instructed to ask the State Horticultural Society, State Dairymen's Association, and State Poultry and Pet Stock Association, to hold their winter meetings, hereafter, at same time and place, and in connection with this Board's Annual Meeting and Winter Corn Exhibit.

Adjourned *sine die.*

# IN MEMORY

OF

# HON. SAMUEL BARNARD,

LATE MEMBER

NEBRASKA STATE BOARD OF AGRICULTURE.

BORN

MONTGOMERY COUNTY, OHIO, JULY 30th, 1837.

DIED

JANUARY 16TH, 1890.

DROPPED DEAD SUDDENLY OF HEART DISEASE, IN RAILROAD CAR AT DEPOT, LINCOLN, NEB.

# CROP AND OTHER AGRICULTURAL PRODUCTS REPORT, FOR THE YEAR 1889.

PREPARED BY THE SECRETARY, R. W. FURNAS, BROWNVILLE, NEB.

In preparing this statement, I have exercised more care and devoted more labor than usual, in order to present as full and complete reports as possible; and yet it is short of what is desired, or should be. It is believed to be as near correct, however, as can be made under existing circumstances. The compilation is made from official State and County records, reports from District and County Agricultural Associations, and ten to twenty correspondents in each organized County—principally from official records. The values, average and general, of lands, both improved and unimproved, and live stock, are entire from official returns and records. These, it must be remembered, are made for taxable purposes, and, as can readily be seen, are far below actual cash values. In the opinion of the compiler this is a mistaken policy, and works injury. The law provides otherwise, and should be enforced.

| COUNTIES. | REAL ESTATE. | | | | | | HORSES. | | |
|---|---|---|---|---|---|---|---|---|---|
| | *Improved.* | | | *Unimproved.* | | | | | |
| | *Acres.* | *Value.* | *Av.* | *Acres.* | *Value.* | *Av.* | *No.* | *Value.* | *Av.* |
| Adams | 237001 | $941571 | $3 97 | 98262 | $217846 | $2 21 | 6655 | $119892 | $18 01 |
| Antelope | 129108 | 378003 | 2 92 | 277025 | 441682 | 1 59 | 7518 | 145455 | 19 34 |
| Blaine | 4520 | 20944 | 4 63 | 18640 | 59416 | 2 75 | 917 | 14706 | 16 03 |
| Box Butte | 13483 | 26022 | 1 93 | 143243 | 276686 | 1 93 | 2976 | 51781 | 17 30 |
| Butler | 217788 | 879725 | 4 03 | 129867 | 374012 | 2 88 | 9761 | 142169 | 14 56 |
| Brown | 36522 | 96424 | 2 62 | 79971 | 136076 | 1 70 | 2476 | 45544 | 18 39 |
| Banner | 4673 | 12974 | 2 77 | 122668 | 233726 | 1 90 | 1909 | 30083 | 15 75 |
| Boone | 111247 | 339215 | 3 04 | 251140 | 410686 | 1 63 | 6323 | 144182 | 22 80 |
| Burt | 148804 | 780784 | 5 24 | 142921 | 436264 | 3 05 | 8116 | 183710 | 22 63 |
| Buffalo | 391474 | 916039 | 2 34 | 118019 | 216405 | 1 83 | 11871 | 173898 | 14 64 |
| Chase | 90499 | 170138 | 1 88 | 100000 | 189399 | 1 89 | 2775 | 56265 | 20 28 |
| Cherry | 9500 | 16738 | 1 76 | 80024 | 133880 | 1 67 | 4928 | 90243 | 18 31 |
| Cedar | 81099 | 345000 | 4 25 | 312114 | 1277750 | 4 09 | 5204 | 64063 | 12 31 |
| Cuming | 149933 | 595460 | 3 97 | 157135 | 516252 | 3 28 | 7939 | 119947 | 15 10 |
| Colfax | 89156 | 407792 | 4 57 | 155597 | 599293 | 3 85 | 6026 | 115290 | 19 13 |
| Clay | 228675 | 965363 | 4 22 | 112722 | 352054 | 3 12 | 10448 | 176843 | 16 92 |
| Custer | 168880 | 355946 | 2 10 | 565242 | 636635 | 1 12 | 15835 | 281289 | 17 76 |
| Cass | 331594 | 1927428 | 5 81 | ...... | ...... | ...... | 12231 | 287107 | 23 47 |
| Cheyenne | 37834 | 67656 | 1 78 | 393001 | 576050 | 1 46 | 4330 | 64190 | 14 82 |
| Dawes | 32587 | 174160 | 5 37 | 121932 | 151199 | 1 24 | 4736 | 143135 | 30 22 |
| Deuel | 9483 | 23268 | 2 46 | 234068 | 269072 | 1 14 | 2353 | 30117 | 12 79 |
| Dakota | 90548 | 569222 | 6 16 | 60365 | 379481 | 6 28 | 3215 | 78393 | 24 38 |
| Dundy | 156723 | 342021 | 2 18 | ...... | ...... | ...... | 2569 | 60332 | 23 48 |
| Douglas | 110119 | 899808 | 17 25 | 76496 | 1572573 | 20 55 | 11411 | 282149 | 24 72 |
| Dixon | 112317 | 408915 | 3 54 | 153692 | 507784 | 3 30 | 4783 | 96423 | 20 16 |
| Dodge | 192980 | 742943 | 3 85 | 123297 | 332901 | 2 70 | 8515 | 170981 | 20 07 |
| Dawson | 135550 | 230612 | 1 70 | 294808 | 375456 | 1 20 | 8745 | 76624 | 8 76 |
| Frontier | 81590 | 179544 | 2 20 | 233615 | 424194 | 1 81 | 6521 | 121560 | 18 64 |
| Franklin | 106070 | 239123 | 2 25 | 215645 | 296842 | 1 37 | 5247 | 66800 | 12 73 |
| Fillmore | 263013 | 993427 | 3 77 | 85745 | 222130 | 2 59 | 10369 | 151968 | 14 65 |
| Furnas | 101640 | 270746 | 2 66 | 254386 | 493726 | 1 94 | 7641 | 113075 | 14 79 |
| Grant | 362 | 1810 | 5 00 | 1449 | 3339 | 2 30 | 343 | 4390 | 12 79 |
| Gage | 349515 | 1595859 | 4 56 | 154857 | 614424 | 3 96 | 16958 | 246783 | 14 55 |
| Greeley | 91290 | 319515 | 3 50 | 189317 | 360925 | 1 90 | 2797 | 55342 | 19 78 |
| Garfield | 13410 | 43553 | 3 24 | 39050 | 61736 | 1 58 | 1225 | 22412 | 18 29 |
| Gosper | 57852 | 178589 | 3 08 | 143841 | 314974 | 2 18 | 3760 | 68728 | 18 27 |
| Howard | 134925 | 402926 | 2 98 | 174418 | 282794 | 1 62 | 5031 | 111394 | 22 14 |
| Hayes | 22120 | 78095 | 3 53 | 140783 | 438601 | 3 11 | 2672 | 114292 | 42 77 |
| Harlan | 80228 | 195687 | 2 44 | 232668 | 411924 | 1 77 | 5856 | 71891 | 12 28 |
| Hamilton | 249876 | 778955 | 3 11 | 74107 | 171477 | 2 31 | 9402 | 174855 | 18 60 |
| Hitchcock | 64987 | 152853 | 2 35 | 160040 | 296047 | 1 85 | 4765 | 83566 | 17 53 |
| Holt | 206284 | 619606 | 3 01 | 604475 | 1188086 | 1 96 | 10093 | 199565 | 19 77 |
| Hall | 201803 | 765650 | 3 79 | 101711 | 295649 | 2 90 | 7653 | 113042 | 14 77 |
| Hooker | 2493 | 5828 | 2 34 | 221 | 663 | 3 00 | 172 | 3127 | 18 18 |
| Jefferson | 147218 | 666148 | 4 53 | 199163 | 672224 | 3 37 | 9211 | 151705 | 16 47 |
| Johnson | 156795 | 804493 | 5 19 | 73363 | 291338 | 3 97 | 6955 | 140587 | 20 21 |
| Keya Paha | 29392 | 77982 | 2 69 | 130946 | 213534 | 1 63 | 2784 | 53591 | 19 21 |
| Kearney | 169605 | 361716 | 2 19 | 113147 | 141473 | 1 25 | 6164 | 87101 | 14 13 |
| Kimball | ...... | ...... | ...... | 312378 | 385652 | 1 23 | 764 | 7394 | 9 67 |
| Knox | 62750 | 191231 | 3 04 | 338672 | 823070 | 2 43 | 5658 | 101559 | 17 94 |
| Keith | 11520 | 25119 | 2 18 | 372480 | 506021 | 1 35 | 1769 | 32075 | 18 13 |
| Lancaster | 313799 | 1995534 | 6 35 | 165854 | 707916 | 4 26 | 16388 | 266666 | 16 20 |
| Loup | 8380 | 35364 | 4 22 | 25388 | 49277 | 1 90 | 1225 | 29774 | 24 31 |
| Logan | 7925 | 32571 | 4 11 | 91548 | 181091 | 1 97 | 1554 | 49934 | 32 13 |
| Lincoln | 44085 | 112846 | 2 55 | 750888 | 652540 | 86 | 7147 | 86151 | 12 05 |
| Merrick | 103620 | 364826 | 3 52 | 160933 | 426728 | 2 65 | 5804 | 96882 | 16 69 |
| Madison | 131810 | 405064 | 3 07 | 192000 | 381920 | 1 98 | 7738 | 112730 | 14 56 |
| Nemaha | 221164 | 1189012 | 5 37 | 18511 | 55857 | 3 01 | 8362 | 175149 | 20 94 |
| Nance | 77951 | 221785 | 2 84 | 159038 | 279605 | 1 75 | 4182 | 56385 | 13 48 |
| Nuckolls | 138066 | 526956 | 3 81 | 201674 | 617357 | 3 06 | 6980 | 119659 | 17 14 |
| Otoe | 352819 | 2657922 | 7 53 | 21969 | 125278 | 5 70 | 11615 | 250535 | 21 56 |
| Platte | 179777 | 613017 | 3 41 | 211490 | 483170 | 2 28 | 8558 | 162204 | 18 95 |
| Pierce | 61087 | 205292 | 3 36 | 229597 | 678188 | 2 95 | 3523 | 70950 | 20 13 |
| Polk | 214339 | 758623 | 3 53 | 39052 | 107074 | 2 75 | 7345 | 125591 | 17 09 |
| Phelps | 143170 | 293138 | 2 05 | 141264 | 252771 | 1 79 | 6480 | 95837 | 14 79 |
| Pawnee | 116662 | 663524 | 5 69 | 141850 | 593804 | 4 18 | 7525 | 147701 | 19 63 |
| Perkins | 23042 | 62499 | 2 71 | 240288 | 541428 | 2 25 | 2633 | 50688 | 19 25 |
| Rock | 57199 | 142997 | 2 50 | 72810 | 137870 | 1 31 | 1954 | 30856 | 10 64 |
| Red Willow | 73843 | 158774 | 2 15 | 224136 | 329786 | 1 47 | 5983 | 81243 | 13 57 |
| Richardson | 293248 | 1642188 | 5 60 | 35000 | 81110 | 2 32 | 11567 | 194061 | 16 77 |
| Sheridan | 5736 | 107408 | 18 72 | 142948 | 267393 | 1 89 | 5121 | 97118 | 18 96 |
| Seward | 330155 | 1415536 | 4 22 | 20165 | 56576 | 2 80 | 10608 | 194878 | 18 31 |
| Scott's Bluff | 2886 | 14659 | 5 07 | 46536 | 90648 | 1 98 | 2113 | 45677 | 21 50 |
| Sarpy | 92504 | 777475 | 8 44 | 46957 | 211463 | 4 54 | 4769 | 106571 | 22 35 |
| Saunders | 453887 | 1341592 | 2 96 | ...... | ...... | ...... | 13729 | 255369 | 18 30 |
| Sioux | 28500 | 70510 | 2 47 | 14422 | 35102 | 2 43 | 2792 | 88423 | 31 67 |
| Saline | 251119 | 933315 | 3 71 | 98970 | 301643 | 3 04 | 12417 | 193579 | 15 58 |
| Sherman | 56220 | 116375 | 2 07 | 224871 | 465484 | 2 07 | 4122 | 78587 | 19 05 |
| Stanton | 82092 | 207090 | 2 52 | 191400 | 376092 | 1 44 | 3181 | 68339 | 21 48 |
| Thomas | 500 | 3130 | 6 26 | 6112 | 21088 | 3 45 | 220 | 3544 | 16 10 |
| Thurston | 7307 | 28068 | 3 84 | 3223 | 11674 | 3 62 | 1593 | 22176 | 13 28 |
| Thayer | 150673 | 589267 | 3 91 | 195168 | 554801 | 2 84 | 7912 | 171977 | 21 73 |
| Valley | 61586 | 184293 | 2 99 | 209191 | 378664 | 1 81 | 4638 | 54339 | 11 71 |
| Washington | 194889 | 877000 | 4 55 | 38977 | 142238 | 3 65 | 7136 | 117783 | 16 50 |
| Webster | 184230 | 661259 | 3 58 | 135161 | 312505 | 2 31 | 6959 | 136602 | 19 62 |
| Wheeler | 19957 | 77233 | 3 87 | 53780 | 208130 | 3 87 | 1483 | 61711 | 41 61 |
| Wayne | ...... | ...... | ...... | 253176 | 1063165 | 4 19 | 4791 | 94952 | 19 82 |
| York | 258118 | 1181695 | 4 57 | 87764 | 210858 | 2 40 | 11653 | 218303 | 18 73 |
| Totals | 10674180 | $43250063 | $4 05 | 13557727 | $30965686 | $2 28 | 540175 | $9754487 | $18 05 |

| COUNTIES. | CATTLE. | | | MULES AND ASSES. | | | SHEEP. | | | HOGS. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *No.* | *Value.* | *Av* | *No.* | *Value.* | *Av.* | *No.* | *Value.* | *Av.* | *No.* | *Value.* | *Av.* |
| Adams | 17659 | $79984 | $4 52 | 837 | $15706 | $18 76 | 1027 | $681 | $0 66 | 19293 | $21129 | $1 09 |
| Antelope | 20340 | 119579 | 5 87 | 539 | 11553 | 21 43 | 946 | 518 | 54 | 17302 | 20678 | 1 19 |
| Blaine | 2439 | 13857 | 5 68 | 79 | 2038 | 25 79 | 48 | 24 | 50 | 1839 | 1911 | 1 03 |
| Box Butte | 4937 | 29652 | 6 00 | 636 | 14345 | 22 55 | 38 | 38 | 1 00 | 1657 | 1876 | 1 13 |
| Butler | 26318 | 88031 | 3 34 | 707 | 11223 | 15 89 | 537 | 241 | 44 | 20398 | 23246 | 1 13 |
| Brown | 5624 | 28384 | 5 04 | 158 | 3308 | 20 93 | 449 | 417 | 92 | 4127 | 4506 | 1 09 |
| Banner | 3648 | 18441 | 5 05 | 203 | 4655 | 22 93 | 82 | 54 | 66 | 775 | 1465 | 1 89 |
| Boone | 18413 | 107925 | 5 86 | 357 | 8706 | 24 38 | 684 | 321 | 47 | 19166 | 23415 | 1 22 |
| Burt | 34127 | 192469 | 5 63 | 894 | 23880 | 26 71 | 509 | 385 | 75 | 30447 | 34004 | 1 11 |
| Buffalo | 40134 | 174569 | 4 34 | 885 | 14695 | 16 60 | 7907 | 5733 | 72 | 33423 | 38084 | 1 13 |
| Chase | 4957 | 35053 | 7 07 | 381 | 9377 | 24 63 | 14 | 13 | 92 | 3889 | 4799 | 1 23 |
| Cherry | 22721 | 116903 | 5 14 | 328 | 8733 | 26 62 | 1502 | 1094 | 72 | 4104 | 4711 | 1 14 |
| Cedar | 21769 | 63003 | 2 89 | 206 | 2943 | 14 28 | 327 | 164 | 50 | 12798 | 7778 | 60 |
| Cuming | 31017 | 97342 | 3 14 | 786 | 13425 | 17 08 | 2883 | 1768 | 61 | 29378 | 18944 | 64 |
| Colfax | 23183 | 113832 | 4 91 | 433 | 8560 | 19 76 | 369 | 163 | 44 | 16776 | 19442 | 1 15 |
| Clay | 29201 | 131985 | 4 52 | 751 | 15890 | 21 15 | 2027 | 962 | 47 | 28493 | 35042 | 1 22 |
| Custer | 32862 | 171060 | 5 20 | 1331 | 32095 | 24 11 | 2310 | 1231 | 53 | 25287 | 53351 | 1 17 |
| Cass | 37332 | 201937 | 5 40 | 1237 | 32099 | 25 94 | 376 | 279 | 74 | 42521 | 58301 | 1 37 |
| Cheyenne | 10005 | 54316 | 5 42 | 375 | 8279 | 22 07 | 3771 | 1885 | 49 | 1279 | 1335 | 1 04 |
| Dawes | 9912 | 101459 | 10 23 | 889 | 32589 | 36 65 | 856 | 525 | 61 | 3123 | 4309 | 1 38 |
| Deuel | 6319 | 35965 | 5 69 | 192 | 3918 | 20 40 | 4649 | 1874 | 42 | 880 | 912 | 1 03 |
| Dakota | 14749 | 79105 | 5 36 | 443 | 11415 | 25 76 | 70 | 33 | 47 | 10907 | 12237 | 1 12 |
| Dundy | 6341 | 46321 | 7 30 | 211 | 6070 | 28 76 | 994 | 497 | 50 | 4001 | 4235 | 1 05 |
| Douglas | 19531 | 134766 | 6 90 | 1512 | 38247 | 25 29 | 426 | 345 | 80 | 12626 | 18066 | 1 43 |
| Dixon | 18414 | 92300 | 5 01 | 340 | 6296 | 18 51 | 342 | 211 | 61 | 10353 | 11494 | 1 11 |
| Dodge | 32643 | 154075 | 4 71 | 803 | 16928 | 21 08 | 13032 | 11823 | 90 | 19221 | 19169 | 99 |
| Dawson | 18899 | 44641 | 2 36 | 447 | 4796 | 10 72 | 677 | 182 | 26 | 16029 | 10936 | 68 |
| Frontier | 14881 | 93006 | 6 31 | 443 | 11003 | 24 83 | 665 | 180 | 49 | 14507 | 15480 | 1 06 |
| Franklin | 14489 | 44582 | 3 08 | 415 | 6284 | 15 14 | 3172 | 1233 | 39 | 17119 | 16216 | 95 |
| Fillmore | 27244 | 122494 | 4 49 | 833 | 12514 | 15 02 | 2917 | 1464 | 50 | 26289 | 28345 | 1 07 |
| Furnas | 16569 | 49119 | 2 97 | 389 | 6881 | 17 69 | 199 | 86 | 43 | 19560 | 12834 | 65 |
| Grant | 3827 | 18639 | 4 87 | 31 | 450 | 14 51 | ........ | ........ | ........ | 92 | 191 | 2 07 |
| Gage | 49171 | 167488 | 3 40 | 1708 | 27256 | 15 95 | 8204 | 4247 | 53 | 46346 | 43747 | 94 |
| Greeley | 8130 | 29239 | 3 59 | 317 | 6249 | 19 71 | 807 | 266 | 32 | 8728 | 9084 | 1 04 |
| Garfield | 3270 | 17056 | 5 21 | 83 | 1986 | 21 52 | 1000 | 613 | 61 | 3312 | 3265 | 99 |
| Gosper | 7736 | 28007 | 3 72 | 256 | 5083 | 19 85 | 211 | 106 | 50 | 9632 | 10429 | 1 08 |
| Howard | 16089 | 81748 | 5 08 | 630 | 16385 | 26 00 | 84 | 85 | 1 01 | 14062 | 18041 | 1 28 |
| Hayes | 6520 | 74538 | 11 43 | 324 | 18421 | 56 89 | ........ | ........ | ........ | 6468 | 22971 | 3 55 |
| Harlan | 14391 | 63620 | 4 42 | 358 | 5072 | 14 16 | 797 | 204 | 26 | 14877 | 14113 | 95 |
| Hamilton | 31645 | 187382 | 4 92 | 854 | 18842 | 22 06 | 776 | 503 | 65 | 28869 | 33586 | 1 19 |
| Hitchcock | 9148 | 47953 | 5 24 | 396 | 8033 | 20 28 | 347 | 407 | 1 17 | 7866 | 9046 | 1 15 |
| Holt | 28408 | 161172 | 5 67 | 569 | 13720 | 24 11 | 3074 | 1723 | 54 | 13415 | 13723 | 1 02 |
| Hall | 31298 | 104303 | 3 33 | 855 | 14987 | 17 53 | 2358 | 1234 | 52 | 18936 | 18359 | 97 |
| Hooker | 634 | 5567 | 8 78 | 2 | 35 | 17 50 | ........ | ........ | ........ | 149 | 274 | 1 84 |
| Jefferson | 30010 | 111662 | 3 76 | 850 | 14388 | 16 92 | 5177 | 2374 | 45 | 26179 | 23061 | 88 |
| Johnson | 24351 | 102288 | 4 20 | 617 | 13584 | 22 01 | 1856 | 965 | 52 | 22654 | 18978 | 1 27 |
| Keya Paha | 8131 | 44680 | 5 49 | 248 | 5062 | 20 41 | 507 | 289 | 57 | 4004 | 3626 | 90 |
| Kearney | 15421 | 50105 | 3 24 | 543 | 8002 | 14 73 | 8875 | 5597 | 63 | 16907 | 17938 | 1 06 |
| Kimball | 1569 | 5398 | 3 44 | 72 | 1222 | 16 97 | 394 | 197 | 50 | 115 | 121 | 1 05 |
| Knox | 17063 | 77723 | 4 55 | 372 | 8964 | 24 09 | 2517 | 1144 | 45 | 9925 | 11796 | 1 19 |
| Keith | 9224 | 47145 | 5 11 | 148 | 3045 | 20 57 | 2605 | 1617 | 62 | 2003 | 2018 | 1 00 |
| Lancaster | 46067 | 246805 | 5 34 | 1408 | 23081 | 16 39 | 1652 | 1544 | 93 | 47318 | 49813 | 1 05 |
| Loup | 3005 | 21953 | 7 31 | 85 | 2858 | 33 62 | 54 | 49 | 91 | 3520 | 6527 | 1 85 |
| Logan | 4560 | 42697 | 9 36 | 96 | 3354 | 34 93 | 3 | 3 | 1 00 | 1883 | 4203 | 2 23 |
| Lincoln | 20231 | 75634 | 3 73 | 333 | 5115 | 15 36 | 4733 | 1686 | 35 | 5840 | 6140 | 1 05 |
| Merrick | 30098 | 142752 | 4 74 | 433 | 7765 | 17 93 | 29954 | 5390 | 18 | 15557 | 18054 | 1 26 |
| Madison | 26390 | 89521 | 3 39 | 548 | 8308 | 15 16 | 927 | 387 | 41 | 18126 | 16722 | 92 |
| Nemaha | 30504 | 154507 | 5 06 | 938 | 24719 | 26 35 | 1004 | 500 | 50 | 25258 | 30994 | 1 22 |
| Nance | 17142 | 88787 | 5 18 | 486 | 5771 | 11 87 | 110 | 25 | 22 | 14296 | 9707 | 67 |
| Nuckolls | 21388 | 120990 | 5 65 | 676 | 13326 | 19 71 | 3188 | 721 | 22 | 20896 | 24066 | 1 15 |
| Otoe | 40357 | 221313 | 5 48 | 1550 | 41417 | 26 72 | 2130 | 1170 | 54 | 38632 | 43928 | 1 13 |
| Platte | 28626 | 148256 | 5 17 | 435 | 8365 | 19 23 | 11676 | 7099 | 61 | 29196 | 15120 | 52 |
| Pierce | 11090 | 58561 | 5 28 | 275 | 6521 | 23 71 | 2131 | 14210 | 6 66 | 7229 | 9441 | 1 30 |
| Polk | 20557 | 84537 | 4 11 | 607 | 11326 | 18 65 | 1594 | 797 | 50 | 21555 | 26716 | 1 23 |
| Phelps | 15460 | 42412 | 2 74 | 551 | 9146 | 16 59 | 122 | 79 | 65 | 19948 | 18848 | 95 |
| Pawnee | 29228 | 128444 | 4 40 | 403 | 9281 | 23 03 | 2795 | 1754 | 63 | 21332 | 27248 | 1 28 |
| Perkins | 3899 | 22727 | 5 83 | 341 | 6514 | 19 10 | 53 | 40 | 75 | 3411 | 3507 | 1 03 |
| Rock | 7364 | 29830 | 4 05 | 103 | 2762 | 26 80 | 1201 | 627 | 52 | 1449 | 1518 | 1 05 |
| Red Willow | 13988 | 56925 | 4 06 | 398 | 7369 | 18 51 | 129 | 47 | 36 | 9177 | 9201 | 1 00 |
| Richardson | 35989 | 144698 | 4 02 | 1200 | 22340 | 18 61 | 1040 | 684 | 66 | 34156 | 40508 | 1 18 |
| Sheridan | 12799 | 78547 | 6 13 | 466 | 10950 | 23 49 | 543 | 270 | 49 | 4810 | 7481 | 1 55 |
| Seward | 31589 | 30281 | 4 12 | 835 | 16973 | 20 32 | 2670 | 1919 | 72 | 31132 | 39465 | 1 26 |
| Scott's Bluff | 3495 | 24593 | 7 15 | 133 | 3914 | 24 43 | 250 | 125 | 50 | 408 | 599 | 1 47 |
| Sarpy | 13 85 | 77637 | 5 88 | 440 | 11645 | 26 46 | 229 | 229 | 1 00 | 10627 | 15607 | 1 48 |
| Saunders | 42450 | 219220 | 5 16 | 947 | 17746 | 18 74 | 355 | 328 | 64 | 36423 | 38402 | 1 05 |
| Sioux | 8018 | 91552 | 11 41 | 145 | 7870 | 53 90 | 1286 | 1195 | 92 | 751 | 1778 | 2 36 |
| Saline | 34575 | 134257 | 3 88 | 720 | 14145 | 19 64 | 272 | 238 | 87 | 36920 | 45557 | 1 23 |
| Sherman | 9767 | 49455 | 5 06 | 337 | 7956 | 23 60 | 804 | 600 | 74 | 10685 | 12937 | 1 21 |
| Stanton | 16369 | 102765 | 6 27 | 249 | 7106 | 28 53 | 2335 | 1464 | 62 | 12256 | 15006 | 1 13 |
| Thomas | 679 | 5001 | 7 36 | 29 | 635 | 21 89 | ........ | ........ | ........ | 229 | 380 | 1 65 |
| Thurston | 3292 | 18544 | 5 60 | 75 | 1388 | 18 50 | ........ | ........ | ........ | 1828 | 2578 | 1 41 |
| Thayer | 20231 | 102809 | 5 08 | 793 | 18766 | 23 66 | 2789 | 1980 | 52 | 21552 | 29424 | 1 36 |
| Valley | 12979 | 39622 | 3 05 | 276 | 4205 | 15 23 | 608 | 283 | 46 | 13520 | 13316 | 98 |
| Washington | 27584 | 90555 | 3 28 | 853 | 15753 | 18 46 | 353 | 228 | 64 | 23698 | 26874 | 1 13 |
| Webster | 21583 | 106387 | 4 92 | 600 | 14170 | 23 61 | 3650 | 1825 | 50 | 19282 | 20268 | 1 05 |
| Wheeler | 4665 | 46958 | 10 06 | 74 | 3456 | 46 70 | 430 | 430 | 1 00 | 2174 | 6049 | 2 78 |
| Wayne | 20854 | 99802 | 4 78 | 537 | 10875 | 20 25 | 2610 | 1300 | 49 | 2784 | 12228 | 4 35 |
| York | 31436 | 185228 | 5 91 | 927 | 19278 | 20 79 | 2264 | 1146 | 50 | 32996 | 39555 | 1 19 |
| Totals | 1624327 | $7788825 | $4 79 | 46576 | $995407 | $21 37 | 179268 | $106268 | $0 59 | 1323962 | $1502412 | $1 13 |

| COUNTIES. | CORN. | | WHEAT. | | OATS. | | BARLEY. | |
|---|---|---|---|---|---|---|---|---|
| | *Acres.* | *Bushels.* | *Acres.* | *Bushels.* | *Acres.* | *Bushels.* | *Acres.* | *Bushels.* |
| Adams | 94240 | 4712000 | 32876 | 493140 | 55672 | 1837176 | 17628 | 616980 |
| Antelope | 64640 | 2262400 | 6648 | 99720 | 14962 | 598480 | 300 | 6600 |
| Banner | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Blaine | 18000 | 360000 | 500 | 8000 | 800 | 32000 | ........ | ........ |
| Boone | 63000 | 2885000 | 14000 | 168000 | 26000 | 1040000 | 1000 | 25000 |
| Box Butte | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Brown | 35000 | 1225000 | 35000 | 525000 | 5000 | 75000 | 2000 | 30000 |
| Buffalo | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Burt | 70573 | 3528650 | 3656 | 73120 | 11963 | 478520 | 70 | 2800 |
| Butler | 200000 | 12000000 | 2550 | 30600 | 50000 | 1750000 | ........ | ........ |
| Cass | 125500 | 6275000 | 28000 | 423000 | 16000 | 640000 | 20000 | 600000 |
| Cedar | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Chase | 56250 | 1125000 | 14060 | 253080 | 16125 | 483750 | 800 | 20000 |
| Cherry | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Cheyenne | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Clay | 119892 | 5994600 | 5500 | 55000 | 50878 | 1526340 | 3001 | 45015 |
| Colfax | 60000 | 2400000 | 8000 | 96000 | 17000 | 680000 | ........ | ........ |
| Cuming | 82273 | 4525015 | 23829 | 357438 | 21602 | 864080 | 1490 | 59600 |
| Custer | 72002 | 2520070 | 10280 | 123360 | 14282 | 428460 | 3586 | 71720 |
| Dakota | 22374 | 1118700 | 3096 | 46440 | 2143 | 85720 | 402 | 12060 |
| Dawes | 5202 | 208080 | 3794 | 75880 | 3618 | 217080 | 298 | 11920 |
| Dawson | 37601 | 1504040 | 25091 | 501820 | 9734 | 584040 | 914 | 36560 |
| Deuel | 1129 | 45160 | 123 | 2460 | 153 | 9180 | 40 | 1600 |
| Dixon | 30000 | 1500000 | 2000 | 30000 | 5000 | 250000 | 500 | 12500 |
| Dodge | 37601 | 2256060 | 25091 | 501820 | 9734 | 272552 | ........ | ........ |
| Douglas | 45881 | 1835240 | 2019 | 40480 | 16233 | 973980 | 2747 | 109880 |
| Dundy | 20000 | 400000 | 2000 | 40000 | 10000 | 300000 | ........ | ........ |
| Fillmore | 124560 | 6850800 | 10009 | 250225 | 55018 | 2310756 | 908 | 22700 |
| Franklin | ........ | ........ | ........ | ........ | ........ | ........ | 908 | ........ |
| Frontier | 25000 | 1025000 | 18000 | 286000 | 10000 | 400000 | 1000 | 16000 |
| Furnas | 85000 | 2550000 | 19000 | 304000 | 65000 | 1625000 | 500 | 10000 |
| Gage | 160000 | 8000000 | 2400 | 60000 | 46000 | 2530000 | 600 | 16200 |
| Garfield | 9000 | 315000 | 1500 | 18000 | 1600 | 48000 | 90 | 2250 |
| Gosper | 60000 | 2400000 | 10900 | 130800 | 4500 | 9000 | 600 | 18000 |
| Grant | 500 | 1250 | ........ | ........ | ........ | ........ | ........ | ........ |
| Greeley | 34537 | 1654165 | 16927 | 253905 | 10200 | 306000 | 575 | 18975 |
| Hall | 110000 | 3300000 | 10625 | 138125 | 30000 | 1200000 | 9000 | 180000 |
| Harlan | 25000 | 750000 | 16000 | 160000 | 6000 | 90000 | 2000 | 40000 |
| Hamilton | 101749 | 5087450 | 3597 | 53955 | 52789 | 1583670 | 1428 | 28560 |
| Hayes | 20000 | 600000 | 7200 | 108000 | 6000 | 150000 | ........ | ........ |
| Hitchcock | 33000 | 825000 | 13680 | 205200 | 15160 | 530600 | 300 | 6000 |
| Holt | 115000 | 3450000 | 10000 | 150000 | 18000 | 630000 | 3500 | 70000 |
| Hooker | 2000 | 80000 | ........ | ........ | ........ | ........ | ........ | ........ |
| Howard | 45134 | 1805360 | 16269 | 325380 | 18362 | 1100720 | 1269 | 50760 |
| Jefferson | 86832 | 3907440 | 5595 | 83925 | 24898 | 746940 | 810 | 20250 |
| Johnson | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Kearney | 62000 | 3410000 | 33000 | 596000 | 21200 | 1223600 | 4600 | 184000 |
| Keith | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Keya Paha | 5000 | 150000 | 2500 | 37500 | 300 | 12000 | ........ | ........ |
| Kimball | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Knox | 31520 | 1116240 | 7880 | 141840 | 15760 | 551600 | 948 | 27544 |
| Lancaster | 257075 | 11477675 | 4444 | 177760 | 43174 | 1295220 | 439 | 5268 |
| Lincoln | 100000 | 3500000 | 40000 | 760000 | 15000 | 630000 | 6000 | 180000 |
| Logan | 8000 | 240000 | 3000 | 45000 | 3000 | 75000 | 10 | 300 |
| Loup | 4811 | 192440 | 448 | 8960 | 791 | 47460 | ........ | ........ |
| Madison | 53592 | 2173680 | 9081 | 181620 | 25679 | 1540740 | 581 | 23240 |
| McPherson | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Merrick | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Nance | 39969 | 1598760 | 3644 | 72880 | 12031 | 721860 | ........ | ........ |
| Nemaha | 59165 | 3254075 | 13778 | 137780 | 14610 | 584400 | 812 | 20300 |
| Nuckolls | 80839 | 3233560 | 2481 | 49620 | 17274 | 1036440 | 287 | 10480 |
| Otoe | 111995 | 3807830 | 12728 | 141008 | 28460 | 967640 | 8467 | 128609 |
| Pawnee | 75000 | 4500000 | 2000 | 36000 | 20000 | 800000 | ........ | ........ |
| Perkins | 19306 | 154448 | 15730 | 141570 | 1630 | 19560 | 687 | 10305 |
| Phelps | 54009 | 3240540 | 29265 | 526770 | 21354 | 747390 | 1048 | 26200 |
| Pierce | 40000 | 1400000 | 25000 | 450000 | 20000 | 700000 | 2000 | 70000 |
| Platte | 68125 | 2861250 | 22720 | 181760 | 31750 | 1270000 | ........ | ........ |
| Polk | 32000 | 1600000 | 11570 | 138840 | 30000 | 900000 | 1000 | 40000 |
| Red Willow | 29907 | 810489 | 10400 | 156000 | 4789 | 143670 | 264 | 6600 |
| Richardson | 104000 | 5200000 | 14000 | 210000 | 20000 | 600000 | 2080 | 72800 |
| Rock | 35000 | 700000 | 20000 | 300000 | 15000 | 225000 | 1000 | 15000 |
| Saline | 113112 | 5090040 | 68511 | 1370220 | 34424 | 1204840 | 800 | 16000 |
| Sarpy | 75000 | 2675000 | 22500 | 30000 | 18000 | 720000 | 2500 | 50000 |
| Saunders | 245621 | 8596735 | 26840 | 322080 | 45460 | 1828400 | ........ | ........ |
| Scott's Bluff | 1430 | 5720 | 36 | 720 | 42 | 2520 | ........ | ........ |
| Seward | 102090 | 5104500 | 6031 | 120620 | 41087 | 1848935 | 824 | 12960 |
| Sheridan | 18500 | 629000 | 55460 | 998280 | 60000 | 2220000 | 16000 | 240000 |
| Sherman | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Sioux | 853 | 26120 | 643 | 12860 | 541 | 32460 | 61 | 2440 |
| Stanton | 30866 | 1234640 | 8232 | 164640 | 8109 | 486540 | 1611 | 64440 |
| Thayer | 82581 | 4129050 | 6050 | 90750 | 24717 | 865095 | 578 | 11560 |
| Thomas | 412 | 16480 | ........ | ........ | ........ | ........ | ........ | ........ |
| Thurston | 30000 | 1500000 | 10500 | 210000 | 5000 | 200000 | 100 | 3000 |
| Valley | 30000 | 1200000 | 12500 | 187500 | 10000 | 40000 | 1000 | 25000 |
| Washington | 53720 | 2148800 | 9640 | 173520 | 8950 | 340100 | 1444 | 50540 |
| Wayne | 20091 | 803640 | 5739 | 114780 | 5090 | 305400 | 565 | 22600 |
| Webster | 60000 | 3000000 | 14000 | 210000 | 10000 | 500000 | 2000 | 50000 |
| Wheeler | 5913 | 236520 | 566 | 11320 | 781 | 46860 | 24 | 960 |
| York | 119842 | 4773680 | 3578 | 71560 | 56998 | 3419880 | 582 | 23280 |

| COUNTIES. | RYE. | | FLAX. | | MILLET. | |
|---|---|---|---|---|---|---|
| | *Acres.* | *Bushels.* | *Acres.* | *Bushels.* | *Acres.* | *Bushels.* |
| Adams | 640 | 12800 | 1500 | 22500 | 550 | 1100 |
| Antelope | 820 | 14760 | 220 | 2200 | 850 | 2125 |
| Banner | ........ | ........ | ........ | ........ | ........ | ........ |
| Blaine | 100 | 2500 | ........ | ........ | ........ | ........ |
| Boone | 500 | 11000 | 500 | 5000 | 2000 | 4000 |
| Box Butte | ........ | ........ | ........ | ........ | ........ | ........ |
| Brown | 7000 | 140000 | 2000 | 30000 | 500 | 1000 |
| Buffalo | ........ | ........ | ........ | ........ | ........ | ........ |
| Burt | ........ | ........ | ........ | ........ | ........ | ........ |
| Butler | 340 | 5100 | 20000 | 200000 | 4000 | 12000 |
| Cass | 5500 | 110000 | 510 | 5100 | 500 | 1500 |
| Cedar | ........ | ........ | ........ | ........ | ........ | ........ |
| Chase | 6000 | 180000 | 2314 | 23140 | 7225 | 10837 |
| Cherry | ........ | ........ | ........ | ........ | ........ | ........ |
| Cheyenne | 250 | 3750 | ........ | ........ | 5000 | 15000 |
| Clay | 1416 | 35400 | 8437 | 84370 | ........ | ........ |
| Colfax | 8000 | 120000 | 2000 | 20000 | ........ | ........ |
| Cuming | 1848 | 29188 | ........ | ........ | ........ | ........ |
| Custer | 380 | 3800 | 386 | 3088 | 116 | 232 |
| Dakota | 475 | 14250 | 2372 | 28464 | ........ | ........ |
| Dawes | ........ | ........ | ........ | ........ | ........ | ........ |
| Dawson | 810 | 20250 | ........ | ........ | ........ | ........ |
| Deuel | ........ | ........ | ........ | ........ | ........ | ........ |
| Dixon | ........ | ........ | 3000 | 45000 | ........ | ........ |
| Dodge | ........ | ........ | ........ | ........ | ........ | ........ |
| Douglas | 285 | 7125 | ........ | ........ | 1115 | 2230 |
| Dundy | ........ | ........ | ........ | ........ | 1000 | 2000 |
| Fillmore | 735 | 20110 | 2952 | 41328 | 115 | 345 |
| Franklin | ........ | ........ | ........ | ........ | ........ | ........ |
| Frontier | 2000 | 30000 | 2000 | 24000 | 3000 | 6000 |
| Furnas | 10000 | 250000 | ........ | ........ | 2000 | 4000 |
| Gage | 240 | 6000 | 10000 | 80000 | ........ | ........ |
| Garfield | 100 | 1500 | ........ | ........ | 150 | 300 |
| Gosper | 500 | 6500 | 200 | 2600 | 1000 | 3000 |
| Grant | ........ | ........ | ........ | ........ | ........ | ........ |
| Greeley | 725 | 22025 | 750 | 7500 | 2000 | 6000 |
| Hall | 10000 | 250000 | 100 | 1200 | 1000 | 2000 |
| Harlan | 8000 | 120000 | 9780 | 97800 | ........ | ........ |
| Hamilton | ........ | ........ | ........ | ........ | ........ | ........ |
| Hayes | 200 | 4000 | 500 | 4500 | 500 | 1000 |
| Hitchcock | 195 | 5850 | 1200 | 12000 | 5500 | 11000 |
| Holt | 21000 | 410000 | ........ | ........ | ........ | ........ |
| Hooker | ........ | ........ | ........ | ........ | ........ | ........ |
| Howard | ........ | ........ | ........ | ........ | ........ | ........ |
| Jefferson | ........ | ........ | 508 | 5080 | 654 | 1308 |
| Johnson | ........ | ........ | ........ | ........ | ........ | ........ |
| Kearney | 3000 | 66000 | 1600 | 28800 | 970 | 4203 |
| Keith | ........ | ........ | ........ | ........ | ........ | ........ |
| Keya Paha | 1000 | 16000 | ........ | ........ | 500 | 10000 |
| Kimball | ........ | ........ | ........ | ........ | ........ | ........ |
| Knox | 1132 | 29432 | 1840 | 120080 | 1440 | 4780 |
| Lancaster | 900 | 18000 | 529 | 6248 | 1454 | 4362 |
| Lincoln | 12000 | 420000 | 100 | 1000 | 7000 | 14000 |
| Logan | 2500 | 45000 | ........ | ........ | 200 | 400 |
| Loup | ........ | ........ | ........ | ........ | ........ | ........ |
| Madison | 93 | 2325 | ........ | ........ | ........ | ........ |
| McPherson | ........ | ........ | ........ | ........ | ........ | ........ |
| Merrick | ........ | ........ | ........ | ........ | ........ | ........ |
| Nance | ........ | ........ | ........ | ........ | ........ | ........ |
| Nemaha | 84 | 2940 | ........ | ........ | ........ | ........ |
| Nuckolls | 1160 | 29000 | 1664 | 16640 | ........ | ........ |
| Otoe | 1752 | 31536 | 320 | 1920 | 3351 | 6602 |
| Pawnee | 500 | 9000 | 1800 | 21600 | 20000 | 60000 |
| Perkins | 1010 | 10100 | 1200 | 6000 | 1020 | 1510 |
| Phelps | 362 | 7240 | 1072 | 10720 | 79 | 158 |
| Pierce | 1000 | 35000 | 1000 | 12000 | 500 | 2000 |
| Platte | ........ | ........ | ........ | ........ | ........ | ........ |
| Polk | 900 | 10800 | 8000 | 96000 | 400 | 800 |
| Red Willow | 708 | 14868 | ........ | ........ | ........ | ........ |
| Richardson | 2000 | 50000 | ........ | ........ | 1000 | 2500 |
| Rock | 1000 | 20000 | 100 | 15000 | 500 | 1000 |
| Saline | ........ | ........ | 1000 | 18000 | 2000 | 5000 |
| Sarpy | 4000 | 60000 | ........ | ........ | 2500 | 7500 |
| Saunders | ........ | ........ | ........ | ........ | 2120 | 4240 |
| Scott's Bluff | ........ | ........ | ........ | ........ | ........ | ........ |
| Seward | 422 | 10128 | 2188 | 35008 | ........ | ........ |
| Sheridan | 22000 | 352000 | 14000 | 140000 | ........ | ........ |
| Sherman | ........ | ........ | ........ | ........ | ........ | ........ |
| Sioux | ........ | ........ | ........ | ........ | ........ | ........ |
| Stanton | 104 | 2600 | 159 | 1590 | ........ | ........ |
| Thayer | 2232 | 33480 | 809 | 12135 | 560 | 1120 |
| Thomas | ........ | ........ | ........ | ........ | ........ | ........ |
| Thurston | 200 | 8000 | 1000 | 8000 | 500 | 1000 |
| Valley | 2000 | 36000 | 2000 | 24000 | 500 | 1500 |
| Washington | 500 | 10000 | 100 | 1000 | 3000 | 6000 |
| Wayne | ........ | ........ | ........ | ........ | ........ | ........ |
| Webster | 3000 | 60000 | 1000 | 12000 | 1000 | 3000 |
| Wheeler | 61 | 1525 | ........ | ........ | ........ | ........ |
| York | 547 | 13675 | 16011 | 160110 | ........ | ........ |

| Counties. | Br'm Corn. | | Potatoes. | | Trees. | | Grape Vines. |
|---|---|---|---|---|---|---|---|
| | *Acres.* | *Tons.* | *Acres.* | *Bushels.* | *Fruit.* | *Forest.* | |
| Adams | 500 | 250 | 4000 | 600000 | 99620 | 2621187 | 15520 |
| Antelope | 50 | 25 | 400 | 24000 | 103910 | 3759634 | 18460 |
| Banner | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Blaine | ........ | ........ | 200 | 80000 | 13500 | ........ | 1000 |
| Boone | ........ | ........ | ........ | ........ | 37300 | 2000000 | 8000 |
| Box Butte | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Brown | 100 | 50 | 3000 | 600000 | 18000 | 2500000 | 15000 |
| Buffalo | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Burt | ........ | ........ | ........ | ........ | 56237 | 2243480 | 12354 |
| Butler | ........ | ........ | 5000 | 1000000 | 170000 | 1600000 | 75000 |
| Cass | 75 | 19 | 1500 | 150000 | 15412 | 3000000 | 39460 |
| Cedar | ........ | ........ | ........ | ........ | 10210 | 262000 | 2320 |
| Chase | 2000 | 1000 | 4300 | 645000 | 23500 | 4000000 | 30000 |
| Cherry | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Cheyenne | ........ | ........ | 2000 | 200000 | ........ | ........ | ........ |
| Clay | ........ | ........ | ........ | ........ | 10000 | 3000000 | 12807 |
| Colfax | ........ | ........ | ........ | ........ | 14000 | 750000 | 3600 |
| Cuming | ........ | ........ | ........ | ........ | 33886 | 483600 | 24460 |
| Custer | ........ | ........ | ........ | ........ | 22537 | 1059375 | 5275 |
| Dakota | ........ | ........ | 600 | 105000 | 17563 | 473989 | 3184 |
| Dawes | ........ | ........ | ........ | ........ | 2046 | 14836 | 739 |
| Dawson | ........ | ........ | ........ | ........ | 9330 | 570789 | 3436 |
| Deuel | ........ | ........ | ........ | ........ | 402 | 4309 | 4 |
| Dixon | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Dodge | ........ | ........ | 1580 | 179600 | 40742 | 1415741 | 16416 |
| Douglas | ........ | ........ | 75 | 13160 | 44558 | 2249873 | 69123 |
| Dundy | 1500 | 750 | 1000 | 100000 | 4285 | 66000 | 1094 |
| Fillmore | ........ | ........ | 5284 | 264200 | 145489 | 4256250 | 24497 |
| Franklin | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Frontier | 5000 | 2500 | 2000 | 200000 | 10000 | 3000000 | 10000 |
| Furnas | 1500 | 750 | 10000 | 1000000 | ........ | ........ | ........ |
| Gage | ........ | ........ | ........ | ........ | 198097 | 1547260 | 53092 |
| Garfield | ........ | ........ | 400 | 60000 | 7214 | 187605 | 1426 |
| Gosper | 6000 | 1500 | 2500 | 225000 | 32150 | 513220 | 7000 |
| Grant | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Greeley | 10 | 7½ | 5000 | 750000 | 52551 | 2421827 | 30000 |
| Hall | 400 | 200 | 4000 | 1000000 | 51500 | 1981080 | 30000 |
| Harlan | 300 | 100 | 1500 | 150000 | 19152 | 606561 | 2125 |
| Hamilton | ........ | ........ | ........ | ........ | 76579 | 2744563 | 32424 |
| Hayes | ........ | ........ | 500 | 7500 | 18000 | 6000000 | 3000 |
| Hitchcock | 50 | 25 | 600 | 60000 | ........ | ........ | ........ |
| Holt | ........ | ........ | 3000 | 900000 | 60000 | 12500000 | 3000 |
| Hooker | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Howard | ........ | ........ | ........ | ........ | 25264 | 1442150 | 3183 |
| Jefferson | ........ | ........ | ........ | ........ | 191938 | 2091398 | 26731 |
| Johnson | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Kearney | ........ | ........ | 2000 | 300000 | 62000 | 2289568 | 11000 |
| Keith | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Keya Paha | ........ | ........ | 500 | 100000 | ........ | ........ | ........ |
| Kimball | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Knox | ........ | ........ | 619 | 142370 | 1565 | 6642000 | 16721 |
| Lancaster | ........ | ........ | 1724 | 172400 | 181687 | 788701 | 46019 |
| Lincoln | 400 | 200 | 15000 | 1500000 | 14876 | 1000000 | 586 |
| Logan | ........ | ........ | 1000 | 100000 | 52000 | 3000000 | 5876 |
| Loup | ........ | ........ | ........ | ........ | 3384 | 91800 | 485 |
| Madison | ........ | ........ | ........ | ........ | 20425 | 2442745 | 5352 |
| McPherson | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Merrick | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Nance | ........ | ........ | ........ | ........ | 25730 | 465577 | 4378 |
| Nemaha | ........ | ........ | 139 | 17375 | 145155 | 1207525 | 29347 |
| Nuckolls | ........ | ........ | ........ | ........ | 61380 | 754492 | 11459 |
| Otoe | ........ | ........ | 1219 | 60950 | 208527 | 558450 | 57863 |
| Pawnee | ........ | ........ | 3000 | 1200000 | 164000 | 1500000 | 35000 |
| Perkins | 50 | 25 | 1337 | 33425 | 7770 | 5640000 | 2300 |
| Phelps | ........ | ........ | ........ | ........ | 47534 | 2039958 | 1787 |
| Pierce | ........ | ........ | 800 | 240000 | 32000 | 4000 | 50000 |
| Platte | ........ | ........ | ........ | ........ | 30000 | 3206100 | 12125 |
| Polk | 1200 | 600 | 800 | 80000 | 60000 | 3000000 | 12000 |
| Red Willow | ........ | ........ | ........ | ........ | 14748 | 624211 | 2822 |
| Richardson | 75 | 38 | 740 | 74000 | 250128 | 2000000 | 20000 |
| Rock | 500 | 250 | 5000 | 1000000 | 23000 | 3000000 | 15000 |
| Saline | ........ | ........ | 50 | 10000 | 128090 | 1286050 | 31532 |
| Sarpy | ........ | ........ | 2000 | 200000 | 57000 | 5000000 | 2000000 |
| Saunders | 1260 | 420 | 2700 | 270000 | 209642 | 1000000 | 45000 |
| Scott's Bluff | ........ | ........ | ........ | ........ | 12 | 100 | 12 |
| Seward | 103 | 101 | 1498 | 149800 | 97326 | 567497 | 39331 |
| Sheridan | ........ | ........ | 12000 | 1200000 | ........ | ........ | ........ |
| Sherman | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Sioux | ........ | ........ | ........ | ........ | 834 | 6400 | 202 |
| Stanton | ........ | ........ | ........ | ........ | 9336 | 986390 | 13359 |
| Thayer | 30 | 15 | 50 | 5000 | 98802 | 1025779 | 11405 |
| Thomas | ........ | ........ | ........ | ........ | 66 | 367 | 39 |
| Thurston | ........ | ........ | ........ | ........ | 2580 | 266650 | 1110 |
| Valley | 30 | 15 | 1000 | 100000 | 67100 | 5000000 | 3500 |
| Washington | 30 | 15 | 3000 | 450000 | 55077 | 952000 | 25680 |
| Wayne | ........ | ........ | ........ | ........ | 8064 | 648150 | 3878 |
| Webster | 1000 | 250 | 2000 | 200000 | 36433 | 977272 | 10181 |
| Wheeler | ........ | ........ | ........ | ........ | 2608 | 513481 | 230 |
| York | ........ | ........ | ........ | ........ | 111407 | 4329036 | 23228 |

# NEBRASKA WEATHER SERVICE.

To Professor Goodwin D. Swezey, Director Boswell observatory, Doane College, Crete, Nebraska, the editor of this volume is again indebted for the monthly Nebraska Weather bulletins and crop reports for the year 1889, as follows:

## JANUARY.

The month of January has been prevailingly warm and pleasant, with almost no severe weather, and with a good amount of precipitation, at least in southeastern, Nebraska, this precipitation occurring mostly in the form of rain.

### TEMPERATURE.

The mean temperature for southeastern Nebraska was 23.5 which is six degrees above the normal, and has not been exceeded since 1882. The maximum was 58 degrees, which is the highest recorded for January, with the exception of the last two years. The lowest temperature for the month was 16 degrees.

### PRECIPITATION.

Two areas of the state have received over an inch of rain, viz., the lower Niobrara basin and the region south of the Platte as far west as Red Willow county. At the extreme west of the state the rainfall was almost nothing.

### NOTES FROM OBSERVERS.

"The month of January has been a singular one. The temperature has been very moderate and uniform. At this station but once has the mercury fallen below zero."—GEO. SHEDD, Ashland.

"Although the month was mild, our ice men harvested an immense quantity of excellent ice. A vast quantity of hay of prime quality was made and stacked through this county, but no diminution of the number of stacks is yet perceptible. The unusually mild weather has saved the feed."—W. L. DUNLAP, Tecumseh.

"Heavy sleet on the 13th. Trees covered thickly for forty-eight hours."— GEO. L. TRUMAN, Genoa.

"The month has been noteworthy for its mild weather and absence of storms." JOHN ELLIS, Marquette.

"Snow has not lain on the ground ten days this winter. The weather is extremely pleasant for winter. I think there is much less wind than usual."— W. A. HARSHBARGER, Franklin.

"The month of January has been dry and warm, with only two days below zero. Some plowing has been done at different times during the month."— WM. WATERMAN, Hay Springs.

### TABLES.

The following are the total number of miles traveled by the wind during the month, the greatest and average velocity per hour, and the monthly mean barometer:

| STATION. | MILES. | GREATEST. | MEAN. | BAROMETER. |
|---|---|---|---|---|
| Crete | 7787 | 48 | 10.5 | .......... |
| Lincoln | 11308 | 46 | 15.2 | 30.17 |
| North Platte | 5998 | 40 | 8.1 | 30.16 |
| Omaha | 6205 | 40 | 8.3 | 30.12 |
| Valentine | 7305 | 62 | 9.8 | 30.16 |
| Yankton, Dakota | 5580 | 41 | 7.5 | 30.11 |

### PRECIPITATION.

The average rain for the different sections of the state for January, 1889, is as follows:

| | INCHES. |
|---|---|
| Southeast section, (including Blue-river valley) | 1.35 |
| Northeast section, (including Elkhorn valley) | 1.11 |
| Niobrara | 0.60 |
| Lower Loup region | 1.10 |
| Upper Loup region | — |
| Republican valley | 1.30 |
| Upper Platte region | 0.97 |
| State average by sections | 1.07 |

### COMPARISON OF PAST JANUARIES.

The table shows the mean temperature, and the number of days below 32 degrees and below zero, for the past twelve Januaries, in southeastern Nebraska. They are found by averaging the numbers reported at the different stations. It also shows the highest temperature and the lowest recorded anywhere in the state by standard self-registering thermometers:

| JANUARY. | MEAN TEMP. | BELOW 32° | BELOW ZERO. | HIGHEST TEMP. | LOWEST TEMP. |
|---|---|---|---|---|---|
| 1878 | 26.9 | 15.0 | .......... | .......... | .......... |
| 1879 | 18.5 | 30.5 | 10.1 | .......... | .......... |
| 1880 | 33.4 | 28.8 | 0.0 | .......... | .......... |
| 1881 | 12.8 | 30.4 | 10.7 | 42.0 | -32.0 |
| 1882 | 24.5 | 28.2 | 1.7 | 50.0 | - 1.0 |
| 1883 | 11.8 | 27.3 | 7.8 | 50.3 | -28.0 |
| 1884 | 17.2 | 27.3 | 7.8 | 48.8 | -32.0 |
| 1885 | 12.3 | 31.0 | 16.1 | 56.8 | -26.8 |
| 1886 | 6.8 | 30.3 | 11.4 | 52.0 | -24.8 |
| 1887 | 13.1 | 31.0 | 13.0 | 59.5 | -30.0 |
| 1888 | 10.2 | 31.0 | 15.4 | 72.0 | -34.6 |
| 1889 | 23.5 | 30.0 | 1.0 | 58.0 | -16.0 |

The following table shows the precipitation, or depth in inches, of rain and melted snow or hail, the number of days on which it fell, and the number of cloudy and of clear days. Days are counted cloudy when the sky is four-fifths overcast; clear when less than one-third. The last column shows the depth of snowfall during the month:

| JANUARY. | PRECIPITATION. | DAYS OF PRECIP. | CLOUDY DAYS. | CLEAR DAYS. | SNOW. |
|---|---|---|---|---|---|
| 1878 | 0.86 | 2.0 | 4.0 | 18.0 | 4.9 |
| 1879 | 0.66 | 2.1 | 3.8 | 17.4 | 3.1 |
| 1880 | 0.54 | 1.8 | 3.8 | 16.9 | 2.6 |
| 1881 | 1.31 | 5.6 | 6.1 | 10.9 | 6.6 |
| 1882 | 0.56 | 3.9 | 6.2 | 12.8 | 3.5 |
| 1883 | 1.09 | 6.7 | 4.3 | 11.7 | 9.7 |
| 1884 | 0.68 | 3.8 | 4.8 | 14.4 | 4.9 |
| 1885 | 0.57 | 4.5 | 5.5 | 13.0 | 3.7 |
| 1886 | 2.04 | 9.1 | 9.5 | 9.9 | 18.8 |
| 1887 | 0.46 | 4.7 | 6.0 | 13.8 | 5.4 |
| 1888 | 0.64 | 2.7 | 4.0 | 13.0 | 3.8 |
| 1889 | 1.35 | 4.3 | 7.7 | 15.7 | 4.3 |

## WEATHER SIGNALS.

The daily temperature and weather predictions of the chief signal officer have been distributed by this service to the following stations, where flags have been displayed for the benefit of the public.

The following are the percentages of correct predictions both as to temperature and weather:

| STATION. | DISPLAYER. | WEATHER. | TEMP. |
|---|---|---|---|
| Arapahoe | J. W. Tomblin | 92.0 | 64.3 |
| Beatrice | F. H. Schmidt | 93.6 | 100.0 |
| Blair | J. H. Stewart & Co. | 90.5 | 95.2 |
| Chester | Stephen Forsdick | 100.0 | 81.5 |
| Coleridge | F. L. Hicks | 88.9 | 88.9 |
| David City | Jno. R. Townsend | 88.5 | 88.5 |
| Fairfield | J. C. Hodge | 83.3 | 86.7 |
| Falls City | A. B. Newkirk | 88.0 | 52.0 |
| Franklin | W. A. Harshbarger | 100.0 | 96.3 |
| Fremont | A. Truesdale | 93.5 | 48.4 |
| Gibbon | C. M. Brooke | 92.6 | 92.5 |
| Grand Island | C. L. Howell | 96.7 | 96.7 |
| Hartington | U. K. Loose | 84.6 | 88.5 |
| Juniata | S. L. Bass | 88.9 | 100.0 |
| Louisville | Thomas Shryock | 100.0 | 92.8 |
| Merna | M. Casteel | ........ | ........ |
| Nebraska City | J. B. Parmalee | ........ | ........ |
| Niobrara | A. B. Yantis | 86.2 | 88.5 |
| Paxton | R. D. Harris | 89.3 | 85.7 |
| Plattsmouth | J. N. Wise | 84.5 | 80.8 |
| Plum Creek | Soren Jensen | 97.2 | 92.3 |
| Stromsburg | G. S. Osborn | 87.1 | 87.8 |
| Tobias | S. Larson | 88.5 | 88.5 |
| Western | J. R. Campbell | 84.6 | 76.9 |
| West Point | E. Briggs | 96.4 | 82.1 |

This gives, as the percentage of correct predictions of the state:

| | |
|---|---|
| Temperature | 85.0 |
| Weather | 91.0 |
| Mean | 88.0 |

## MONTHLY MISCELLANEOUS DATA.

| STATIONS. | OBSERVERS. | TEMPERATURE OF THE AIR IN DEGREES FAHRENHEIT. | | | | | *Precipitation in inches.* | | *No. of rainy days, .01 inch or more* | *No. of cloudy days* | *No. of fair days* | *No. of clear days* | *Prevailing direction of the wind* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Monthly mean from—* | | | *Maximum* | *Minimum* | | | | | | | |
| | | Tri-daily observations. | Noon observations | Max. and Min. | | | Monthly, including melted snow | Total monthly snow-fall | | | | | |
| **SOUTHEAST SECTION.** | | | | | | | | | | | | | |
| Ashland | Geo. Shedd | ...... | ...... | ...... | 46 | -3 | 1.34 | 2.50 | 3 | 6 | 9 | 16 | N |
| *Crete, *a* | G. I. Gilbert | 24.6 | ...... | 25.7 | 52 | -5 | 1.45 | 3.13 | 5 | 9 | 10 | 12 | NW |
| *Crete, *b* | Observer, S. S | ...... | ...... | 25.7 | 52 | -5 | 1.45 | 4.40 | 5 | 9 | 8 | 14 | NW |
| David City | J. R. Townsend | 21.2 | ...... | ...... | 48 | -0 | ...... | 6.50 | ...... | ... | ... | ... | NW |
| Fairbury | Dr. Humphrey | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ... | ... | ... | ...... |
| *Falls City | A. B. Newkirk | 23.5 | ...... | 26.2 | 46 | -4 | 1.51 | 7.30 | 1 | 9 | 8 | 14 | ...... |
| *Lincoln, Univ. of Neb. | F. F. Almy | 25.6 | ...... | ...... | 48 | -4 | 1.28 | 3.20 | 6 | 9 | 6 | 16 | N |
| Marquette | John Ellis | ...... | 29.8 | ...... | 50 | -5 | 0.84 | 2.02 | 5 | ... | ... | ... | ...... |
| Minden | Joel Hall | 21.1 | 31.5 | ...... | 48 | -4 | 1.37 | 2.20 | 5 | 5 | 9 | 17 | N |
| Nebraska City | J. B. Parmalee | 23.6 | ...... | ...... | 49 | -3 | 1.30 | ...... | ...... | ... | ... | ... | ...... |
| Syracuse | P. W. Riser | 24.8 | ...... | ...... | 45 | 2 | 1.15 | 8.00 | 4 | ... | ... | ... | NW |
| Tecumseh | W. L. Dunlap | ...... | ...... | 25.9 | 45 | -4 | 1.65 | 4.00 | 3 | 10 | 4 | 17 | ...... |
| Weeping Water | Geo. Treat | 23.8 | ...... | ...... | 45 | -6 | 1.62 | 4.00 | 7 | 6 | 9 | 16 | NW |
| Mean for section | | 23.5 | ...... | ...... | ... | ...... | 1.35 | 4.29 | 4.3 | ... | ... | ... | ...... |
| **NORTHEAST SECTION.** | | | | | | | | | | | | | |
| Creighton | Dr. Geo. Roberts | 18.7 | ...... | 18.6 | 45 | -15 | 1.75 | ...... | 5 | ... | ... | ... | NW |
| De Soto | Chas. Seltz | 22.6 | ...... | ...... | 44 | -4 | 1.18 | 2.75 | 4 | ... | ... | ... | N |
| Fremont | I. E. Heaton | 22.0 | ...... | 21.8 | 46 | -4 | 0.56 | 2.96 | 6 | ... | ... | ... | ...... |
| Oakdale | G. S. Clingman | 19.6 | ...... | 20.6 | 46 | -13 | 0.88 | 1.25 | 4 | 9 | 7 | 15 | NW |
| *Omaha | Observer S. S | 22.8 | ...... | 24.0 | 47 | -2 | 1.62 | ...... | 7 | 12 | 7 | 12 | NW |
| Ponca | A. N. Porter | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ... | ... | ... | ...... |
| West Point | E. G. Bruner | ...... | 27.7 | ...... | 45 | -10 | 0.90 | 1.00 | 5 | ... | ... | ... | NW |
| *Yankton, Dak | Observer S. S | 18.1 | ...... | 20.0 | 47 | -12 | 0.06 | ...... | 5 | 5 | 10 | 16 | NW |
| Mean for section | | 20.6 | ...... | 21.0 | ... | ...... | 1.12 | 1.13 | 5.1 | ... | ... | ... | ...... |
| Mean for East Neb | | 22.0 | .... | 23.5 | ... | ...... | 1.24 | 2.71 | 4.7 | ... | ... | ... | ...... |
| **LOWER LOUP.** | | | | | | | | | | | | | |
| Genoa | G. S. Truman | 22.3 | ...... | 21.7 | 48 | -7 | 1.12 | 5.00 | 5 | 8 | 8 | 15 | NW |
| North Loup | M. B. C. True | 22.5 | ...... | ...... | 44 | -9 | 0.93 | ...... | 2 | ... | ... | ... | NW |
| Palmer | C. Shieldstream | 20.5 | ...... | ...... | 46 | -6 | 1.70 | 6.00 | 3 | ... | ... | ... | N |
| Ravenna | E. Smith | ...... | 32.6 | ...... | 46 | -5 | 1.02 | 1.50 | 5 | 3 | 11 | 17 | NW |
| West Hill | J. L. Truman | 20.4 | ..... | ...... | 45 | -10 | 0.75 | 1.50 | 4 | 6 | 10 | 15 | NW |
| **UPPER LOUP.** | | | | | | | | | | | | | |
| Ansley | Peter Fowlie | 20.3 | ...... | 20.7 | 52 | -5 | ...... | 2.00 | 3 | ... | ... | ... | N |
| Sargent | J. S. Spooner | 21.0 | ...... | ...... | 42 | -13 | 1.00 | 8.00 | 3 | ... | ... | ... | NW |
| Mean for Loup section | | 21.2 | ...... | 21.2 | ... | ...... | 1.09 | 4.0 | ...... | ... | ... | ... | ...... |
| **NIOBRARA.** | | | | | | | | | | | | | |
| Fort Robinson | Hospital Steward | ...... | ...... | 26.2 | 55 | 1 | 0.08 | 0. 0 | 3 | 7 | 4 | 20 | W |
| Kennedy | Mrs. Erickson | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ... | ... | ... | ...... |
| *Hay Springs | Wm. Waterman | 20.7 | ...... | 21.2 | 49 | -5 | 0.46 | 5.00 | 4 | 2 | 8 | 21 | NW |
| *Valentine | Observer S. S. | 21.0 | ...... | 24.6 | 58 | -10 | 1.27 | ...... | 9 | 9 | 4 | 18 | W |
| **REPUBLICAN.** | | | | | | | | | | | | | |
| Culbertson | G. D. Carrington | 23.7 | 36.8 | ...... | 56 | -16 | ...... | 5.00 | 2 | 3 | 5 | 23 | NW |
| Franklin | W. A. Harshbarger | 20.0 | ...... | 23.2 | 58 | -4 | 1.60 | 1.30 | 3 | ... | ... | ... | ...... |
| Red Willow | Mrs. R. Buck | ...... | ...... | ...... | ... | ...... | 1.90 | ...... | ...... | .. | ... | ... | ...... |
| **UPPER PLATTE.** | | | | | | | | | | | | | |
| *Kimball | Wm. G. Barton | ...... | ...... | ...... | 48 | ...... | ...... | ...... | ...... | ... | ... | ... | ...... |
| *North Platte | Observer S. S. | 17.6 | ...... | 20.5 | ... | -9 | 0.97 | ...... | 6 | 6 | 12 | 13 | W |
| Plum Creek | Geo. T. Cain | ..... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ... | ... | ... | ...... |
| Sidney | Oberfelder & Co. | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ... | ... | ... | ...... |
| Mean for West Neb | | 20.6 | ...... | 23.1 | ... | ...... | 0.90 | ...... | ...... | ... | ... | ... | ...... |
| Mean for State | | 21.8 | ...... | 22.8 | ... | ...... | 1.12 | ...... | ...... | ... | ... | ... | NW |

* Maximum and minimum temperature from self-registering thermometer.

## FEBRUARY.

The month of February has been a prevailingly warm and dry month, although two distinct cold waves, one from the 4th to the 6th and the other from the 21st to the 23d, brought the mean temperature of the month down to about normal. The precipitation has been less than for any year except 1878 and 1880.

### TEMPERATURE.

The mean for the month has been 22.8 degrees. February has an extremely variable mean temperature, being sometimes as high as 35 degrees and sometimes as low as 10 degrees. There have been the normal number of freezing days, but rather less than usual below zero. The minimum for the month was 27 below zero, in the northern part of the state, which is the lowest February minimum recorded.

### PRECIPITATION.

Only one station, Falls City, in the extreme southeastern part of the state, reports an inch of precipitation, and only two others report over half an inch, one being Tecumseh, also in the southeastern part, and the other Hay Springs, in the far northwest. The number of cloudy days was about normal and the number of rainy days a little below normal.

### NOTES FROM OBSERVERS.

"The past winter has been remarkably mild and still, free from any heavy storms such as have usually happened in previous winters. The mean temperature for the three winter months of 1887 and 1888 is 18.5 degrees, and for the same months 1888 and 1889, 25.4 degrees."—G. Treat, Weeping Water.

"The past month has produced the coldest weather of this winter, including the lowest minimum of any February in eight years. There were two cold waves of unusual severity, force, and suddenness, one on the 4th and one on the 21st, besides two or three minor cold waves."—G. S. Clingman, Oakdale.

"We have had almost no winter, being the mildest I have witnessed in fifty or more years."—Dr. Humphrey, Fairbury.

"The coldest wave of the winter struck us on the 22d. Prairie chickens began crowing on the 26th. Saw first blackbird on the 27th."—J. S. Spooner, Sargent.

"The cold wave commencing on the 17th and reaching to and including the 23d, marked the lowest temperature of the winter. The ground was covered with snow during this period, but the rest of the month it has been practically bare."—W. A. Harshbarger, Franklin.

### TABLES.

The following are the total number of miles traveled by the wind during the month, the maximum and average velocity per hour, the mean humidity of the air, and the monthly mean barometer:

| STATION. | MILES. | MAX. | MEAN. | HUM. | BAR. |
|---|---|---|---|---|---|
| Crete | 6474 | 56 | 9.5 | ........... | 30.29 |
| Lincoln | ........... | 65 | ........... | ........... | 30.27 |
| North Platte | 6310 | 58 | 9.3 | 67 | 30.20 |
| Omaha | 6776 | 60 | 10.1 | 74 | 30.23 |
| Valentine | 6252 | 60 | 9.2 | 72 | 30.22 |
| Yankton, Dak | 5781 | 60 | 8.6 | 73 | 30.20 |

### COMPARISON OF PAST FEBRUARIES.

The table shows the mean temperature, and the number of days below 32 degrees and below zero, for the past twelve Februaries, in southeastern Nebraska. They are found by averaging the numbers reported at the different stations. It also shows the highest temperature, and the lowest recorded anywhere in the state, by standard self-registering thermometers:

| FEBRUARY. | MEAN TEMP. | BELOW 32° | BELOW ZERO. | HIGHEST TEMP. | LOWEST TEMP. |
|---|---|---|---|---|---|
| 1878 | 35.6 | .......... | .......... | .......... | .......... |
| 1879 | 19.6 | .......... | .......... | .......... | .......... |
| 1880 | 30.1 | 26.0 | 1.2 | .......... | .......... |
| 1881 | 18.2 | 25.4 | 5.5 | 40.0 | -23.0 |
| 1882 | 33.4 | 23.0 | 0.7 | 63.8 | -7.5 |
| 1883 | 20.5 | 24.2 | 5.6 | 61.0 | -24.9 |
| 1884 | 18.5 | 27.3 | 9.0 | 57.2 | -20.0 |
| 1885 | 15.9 | 22.6 | 10.9 | 57.0 | -22.2 |
| 1886 | 25.3 | 25.6 | 3.8 | 64.3 | -19.4 |
| 1887 | 19.0 | 27.9 | 7.8 | 63.8 | -24.3 |
| 1888 | 10.2 | 23.0 | 15.4 | 67.8 | -19.8 |
| 1889 | 22.8 | 23 3 | 4.2 | 66.0 | -27.0 |

The following table shows the precipitation, or depth in inches, of rain and melted snow or hail, the number of days on which it fell, and the number of cloudy and of clear days. Days are counted cloudy when the sky is four-fifths overcast; clear when less than one-third. The last column shows the depth of snowfall during the month:

| FEBRUARY. | PRECIPITATION. | DAYS OF PRECIP. | CLOUDY DAYS. | CLEAR DAYS. | SNOW. |
|---|---|---|---|---|---|
| 1878 | 0.19 | 2.1 | 5.7 | 11.0 | 0.9 |
| 1879 | 0.76 | 3.2 | 2.7 | 8.5 | 6.3 |
| 1880 | 0.14 | 1.6 | 0.9 | 18.1 | 0.4 |
| 1881 | 2.76 | 5.2 | 7.0 | 10.2 | 14.4 |
| 1882 | 0.82 | 2.9 | 4.0 | 17.8 | 6.4 |
| 1883 | 0.90 | 5.2 | 6.2 | 13.4 | 4.9 |
| 1884 | 0.78 | 5.2 | 7.2 | 8.9 | 7.1 |
| 1885 | 1.12 | 6.0 | 7.6 | 11.2 | 9.3 |
| 1886 | 0.70 | 4.2 | 3.8 | 16.1 | 5.5 |
| 1887 | 1.06 | 6.4 | 9.8 | 12.0 | 8.4 |
| 1888 | 0.91 | 4.3 | 5.0 | 6.0 | 1.8 |
| 1889 | 0.35 | 3.5 | 7.2 | 8.9 | 2.3 |

### WEATHER SIGNALS.

The daily temperature and weather predictions of the chief signal officer have been distributed by this service to the following stations, where flags have been displayed for the benefit of the public.

The following are the percentages of correct predictions both as to temperature and weather:

| STATION. | DISPLAYER. | WEATHER. | TEMP. |
|---|---|---|---|
| Arapahoe | J. W. Tomblin | 69.1 | 69.1 |
| Beatrice | F. H. Schmidt | 83.3 | 91.7 |
| Blair | J. H. Stewart & Co. | 90.0 | 90.0 |
| Chester | Stephen Forsdick | 62.5 | 75.0 |
| Coleridge | F. L. Hicks | 91.3 | 91.0 |
| David City | John R. Townsend | 98.3 | 71.4 |
| Fairfield | J. C. Hodge | 95.2 | 87.0 |
| Falls City | A. B. Newkirk | 56.7 | 77.3 |
| Franklin | W. A. Harshbarger | 72.7 | 81.8 |
| Fremont | A. Truesdale | 85.7 | 75.0 |
| Gibbon | C. M. Brooke | 69.6 | 100.0 |
| Grand Island | C. L. Howell | 85.7 | 85.7 |
| Hartington | U. K. Loose | 91.7 | 87.5 |
| Juniata | S. L. Bass | 87.5 | 87.5 |
| Louisville | Thomas Shryock | 95.4 | 85.7 |
| Merna | M. Casteel | ................ | ........ |
| Nebraska City | J. B. Parmalee | ................ | ........ |
| Niobrara | A. B. Yantis | 91.3 | 95.6 |
| Paxton | R. D. Harris | 87.0 | 75.0 |
| Plattsmouth | J. N. Wise | 78.3 | 73.9 |
| Ponca | A. G. Kingsbury | 96.4 | 96.4 |
| Plum Creek | Soren Jensen | 78.3 | 87.0 |
| Stromsburg | G. S. Osborn | 80.0 | 87.7 |
| Superior | G. J. Spoky | 96.3 | 92.6 |
| Tobias | S. Larson | 73.8 | 91.3 |
| Western | J. R. Campbell | 73.9 | 78.3 |
| West Point | F. Briggs | 73.9 | 95.6 |

This gives, as the percentage of correct predictions of the state:

| | |
|---|---|
| Temperature | 85.0 |
| Weather | 82.2 |
| Mean | 83.6 |

## MONTHLY MISCELLANEOUS DATA.

| STATIONS. | OBSERVERS. | TEMPERATURE OF THE AIR IN DEGREES FAHRENHEIT. |  |  |  |  | *Precipitation in inches.* |  | *No. rainy days, .01 inch or more.....* | *No. of cloudy days.....* | *No. of fair days.....* | ***No. of clear days.....*** | ***Prevailing direction of the wind.*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  | *Monthly mean from—* Tri-daily observations... | Noon observations..... | Max. and Min...... | *Maximum.....* | *Minimum.....* | Monthly, including melted snow..... | Total monthly snow fall..... |  |  |  |  |  |
| **SOUTHEAST SECTION.** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Ashland. | Geo. Shedd | ...... | ...... | ...... | 48 | -20 | 0.14 | 1.60 | 4 | 4 | 9 | 15 | N |
| *Crete, *a* | G. I. Gilbert | 22.3 | ...... | 23.9 | 52 | -16 | 0.25 | 3.20 | 5 | 6 | 17 | 5 | NW |
| *Crete, *b* | Observer S. S. | ...... | ...... | 23.9 | 52 | -16 | 0.25 | 2.70 | 5 | 11 | 8 | 9 | NW |
| David City | J. R. Townsend | 22.2 | ...... | 21.6 | ... | ...... | 0.20 | 2.00 | 3 | ... | ...... | ...... | NW |
| Fairbury | Dr. Humphrey | ...... | ...... | ...... | 56 | -6 | 0.36 | 4.50 | 3 | ... | ...... | ...... | ...... |
| *Falls City | A. B. Newkirk | 22.4 | ...... | 25.7 | 59 | -12 | 1.06 | 1.80 | 5 | 10 | 12 | 8 | N |
| *Lincoln | F. F. Almy | 21.9 | ...... | ...... | 52 | -17 | 0.23 | 1.00 | 3 | 5 | 15 | 8 | N |
| Marquette | John Ellis | ...... | 30.1 | ...... | 53 | -10 | 0.12 | 1.25 | 3 | ... | ...... | ...... | ...... |
| Minden | Joel Hull | 25.1 | 32.8 | ...... | 54 | -16 | 0.15 | 0.50 | 3 | 7 | 10 | 11 | NW |
| Nebraska City | J. B. Parmelee | 22.6 | ...... | ...... | 56 | -13 | 0.29 | ...... | 2 | ... | ...... | ...... | ...... |
| Syracuse | P. W. Risser | 24.3 | ...... | ...... | 57 | -8 | 0.45 | 2.25 | 4 | ... | ...... | ...... | NW |
| Tecumseh | W. L. Dunlap | ...... | ...... | 22.3 | 55 | -15 | 0.75 | 5.50 | 1 | 10 | 8 | 10 | NW |
| Weeping Water | Geo. Treat | 21.7 | ...... | ...... | 51 | -12 | 0.24 | 4.00 | 5 | 5 | 18 | 5 | NW |
| Mean for section | ...... | 22.8 | ...... | 23.5 | ... | ...... | 0.35 | 2.33 | 3.5 | 7.2 | 12.1 | 8.9 | NW |
| **NORTHEAST SECTION.** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Creighton | Dr. Geo. Roberts | 16.9 | ...... | 18.8 | 55 | -27 | ...... | 1.50 | 4 | ... | ...... | ...... | NW |
| De Soto | Chas. Seltz | 22.6 | ...... | ...... | 51 | -11 | 0.23 | 2.50 | 3 | ... | ...... | ...... | N |
| Fremont | I. E. Heaton | 22.6 | ...... | 24.4 | 49 | -20 | 0.35 | 2.50 | 5 | ... | ...... | ...... | ...... |
| Oakdale | G. S. Clingman | 16.9 | ...... | 18.4 | 56 | -26 | 0.13 | 1.50 | 5 | 11 | 7 | 10 | NW |
| *Omaha | Observer S. S. | 21.1 | ...... | 23.0 | 53 | -10 | 0.23 | ...... | 3 | 12 | 10 | 6 | NW |
| Ponca | A. N. Porter | ...... | ...... | ...... | ... | ...... | ...... | ...... | ... | ... | ...... | ...... | ...... |
| West Point | E. G. Brunner | ...... | 29.6 | ...... | 52 | -20 | 0.10 | 0.50 | 5 | ... | ...... | ...... | NW |
| *Yankton, Dakota | Observer S. S. | 16.8 | ...... | 18.4 | 56 | -18 | 0.20 | ...... | 8 | 6 | 9 | 13 | NW |
| Mean for section | ...... | 19.5 | ...... | 19.9 | ... | ...... | 0.21 | 1.50 | 4.7 | 9.7 | 8.7 | 9.7 | NW |
| Mean for East Neb. | ...... | 21.1 | ...... | 21.7 | ... | ...... | 0.28 | 1.91 | 4.1 | 8.4 | 10.4 | 9.3 | NW |
| **LOWER LOUP.** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Genoa | G. S. Trueman | ...... | ...... | 21.3 | 51 | -19 | 0.10 | 1.50 | 3 | 14 | 4 | 10 | NW |
| North Loup | M. B. C. True | 22.1 | ...... | ...... | 50 | -10 | 0.11 | ...... | 2 | ... | ...... | ...... | NW |
| Palmer | C. Shieldstream | 20.3 | ...... | ...... | 52 | -10 | 0.10 | 1.00 | 1 | ... | ...... | ...... | N |
| Ravenna | E. Smith | ...... | 34.1 | ...... | 54 | -8 | 0.03 | 0.10 | 2 | 6 | 8 | 14 | NW |
| West Hill | J. L. Truman | 19.3 | ...... | ...... | 50 | -21 | 0.07 | 1.00 | 3 | 9 | 11 | 7 | NW |
| **UPPER LOUP.** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Ansley | Peter Fowlie | 22.2 | ...... | 23.4 | 60 | -9 | T | T | 0 | ... | ...... | ...... | N |
| Sargent | J. S. Spooner | 21.6 | ...... | ...... | 51 | -14 | 0.17 | 0.75 | 2 | ... | ...... | ...... | NW |
| Mean for Loup section. | ...... | 21.1 | ...... | 22.3 | ... | ...... | 0.08 | 0.73 | 1.9 | 9.7 | 7.7 | 10.3 | NW |
| **NIOBRARA.** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Fort Robinson | Hospital Steward | ...... | ...... | 27.4 | 64 | -17 | 0.12 | 0.50 | 4 | 10 | 14 | 6 | W |
| Kennedy | Mrs. Erickson | 21.0 | ...... | ...... | 63 | -13 | ...... | 6.20 | 6 | 3 | 9 | 10 | NW |
| *Hay Springs | Wm. Waterman | 18.6 | ...... | 20.0 | 56 | -20 | 0.94 | 9.50 | 6 | 3 | 11 | 14 | NW |
| *Valentine | Observer S. S. | 21.6 | ...... | ...... | 66 | -15 | 0.15 | ...... | 3 | 11 | 3 | 14 | N |
| **REPUBLICAN.** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Culbertson | G. D. Carrington | 28.5 | 41.0 | ...... | 60 | -14 | 0.51 | 0.50 | 1 | 6 | 7 | 15 | NW |
| Franklin | W. A. Harshbarger | 19.4 | ...... | 24.2 | 54 | -8 | 0.20 | 2.00 | 3 | ... | ...... | ...... | ...... |
| Red Willow | Mrs. R. Buck | ...... | ...... | ...... | ... | ...... | T | T | 0 | ... | ...... | ...... | ...... |
| **UPPER PLATTE.** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Kimball | Wm. G. Barton | ...... | ...... | ...... | ... | ...... | ...... | ...... | ... | ... | ...... | ...... | ...... |
| *North Platte | Observer S. S. | 23.2 | ...... | 26.6 | 56 | -6 | 0.07 | ...... | 3 | 6 | 18 | 4 | NW |
| Plum Creek | Geo. T. Cain | ...... | ...... | ...... | ... | ...... | ...... | ...... | ... | ... | ...... | ...... | ...... |
| Sidney | Oberfelder & Co | ...... | ...... | ...... | ... | ...... | ...... | ...... | ... | ... | ...... | ...... | ...... |
| Mean for West Neb. | ...... | 22.0 | ...... | 24.6 | ... | ...... | 0.28 | 3.77 | 3.2 | 6.5 | 10.3 | 10.5 | NW |
| Mean for State | ...... | 21.4 | ...... | 22.8 | ... | ...... | 0.23 | 2.08 | 3.2 | 8.3 | 9.7 | 9.8 | NW |

***Maximum and minimum temperature from self-registering thermometer. T in precipitation column indicates trace.**

## MARCH.

The month of March has been one of high mean temperature, though not of extremes of temperature. The precipitation has been about normal, except through the central part of the state, where it has been large.

### TEMPERATURE.

The mean for the month has been 42.1 degrees, which is six degrees above the normal, and is higher than for any March since 1878. The highest for the month was 76 degrees, which has been four times exceeded since 1878. About half of the days of the month have reached the freezing point, but the thermometer has not fallen to zero.

### PRECIPITATION.

The precipitation for the month of March is quite variable, and for the past month has been neither very large nor very small. A narrow strip running north and south through central Nebraska has had over two inches; the borders of this strip and the southern part of the state generally have been from one to two inches, while the eastern and western portions have had less than an inch, falling off to a mere trace at the extreme west.

### NOTES FROM OBSERVERS.

" March has been mild and sunny, without much precipitation. The ground is in fair condition on the surface, but very dry beneath."—G. TREAT, Weeping Water.

" The past month has been one of high mean temperature. Save for the cold period from the 8th to the 10th, and the cold waves of the 14th and 29th, the weather has also been very mild. The month has also been a dry one, with a total precipitation of only .20 of an inch."—G. S. CLINGMAN, Oakdale.

"At the close of the month, nearly all the grain sown and most of it up, looking thrifty. Condition of nearly all kinds of grain fully average. Ground in prime condition for plowing."—JOEL HULL, Minden.

" Frost was slow of going out of ground, notwithstanding it has been so warm. Wheat was all sown the first two weeks of this month, and farmers are now busy putting in oats. The ground is in fine working condition."—J. S. SPOONER, Sargent.

" The month has been warm and pleasant, with less than average rainfall. More wheat was sown this year than ever before, and was well put in."—WM. WATERMAN, Hay Springs.

### TABLES.

The following are the total number of miles traveled by the wind during the month, the maximum and average velocity per hour, the mean humidity of the air, and the monthly mean barometer:

| STATION. | MILES. | MAX. | MEAN. | HUM. | BAR. |
|---|---|---|---|---|---|
| Crete | 7,708 | 35 | 10.4 | .............. | 30.118 |
| Lincoln | 10,411 | 36 | 14.0 | .............. | 30.110 |
| North Platte | 6,336 | 30 | 8.6 | 60 | 30.107 |
| Omaha | 6,050 | 34 | 8.2 | 64 | 30.099 |
| Valentine | 6,399 | 48 | 8.6 | 65 | 30.110 |
| Yankton, Dakota | 5,923 | 32 | 8.0 | 62 | 30.096 |

### COMPARISON OF PAST MARCHES.

The table shows the mean temperature, and number of days below 32 degrees and below zero, for the past twelve Marches, in southeastern Nebraska. They are found by averaging the numbers reported at the different stations. It also shows the highest temperature and the lowest recorded anywhere in the state, by standard self-registering thermometers:

| MARCH. | MEAN TEMP. | BELOW 32° | BELOW ZERO. | HIGHEST TEMP. | LOWEST TEMP. |
|---|---|---|---|---|---|
| 1878 | 46.8 | 9.3 | ............ | 80.0 | 22.0 |
| 1879 | 40.6 | ............ | ............ | 86.0 | 1.0 |
| 1880 | 34.8 | 22.2 | 1.8 | ............ | ............ |
| 1881 | 29.2 | 28.4 | 0.0 | 51.0 | 4.0 |
| 1882 | 40.2 | 16.4 | 0.0 | 77.3 | 4.0 |
| 1883 | 33.6 | 26.3 | 0.1 | 71.0 | 3.0 |
| 1884 | 34.8 | 17.4 | 1.4 | 73.0 | - 4.6 |
| 1885 | 35.7 | 26.2 | 0.0 | 70.2 | 7.0 |
| 1886 | 31.7 | 24.8 | 1.6 | 73.0 | -15.0 |
| 1887 | 37.7 | 21.9 | 0.0 | 79.8 | - 5.5 |
| 1888 | 29.5 | 24.0 | 1.2 | 80.0 | -15.0 |
| 1889 | 42.1 | 16.5 | 0.0 | 76.0 | 4.0 |

The following table shows the precipitation, or depth in inches, of rain and melted snow or hail, the number of days on which it fell, and the number of cloudy and of clear days. Days are counted cloudy when the sky is four-fifths overcast; clear when less than one-third. The last column shows the depth of snowfall during the month:

| MARCH. | PRECIPITATION. | DAYS OF PRECIP. | CLOUDY DAYS. | CLEAR DAYS. | SNOW. |
|---|---|---|---|---|---|
| 1878 | 1.64 | 4.3 | 5.4 | 13.8 | 3.8 |
| 1879 | 0.63 | 3.5 | 2.3 | 14.2 | 3.6 |
| 1880 | 0.49 | 2.6 | 2.2 | 16.3 | 4.7 |
| 1881 | 1.77 | 6.0 | 6.6 | 12.6 | 12.1 |
| 1882 | 0.26 | 2.3 | 2.6 | 15.8 | 3.0 |
| 1883 | 0.59 | 4.6 | 9.7 | 11.8 | 5.2 |
| 1884 | 2.36 | 8.7 | 10.6 | 7.0 | 2.4 |
| 1885 | 0.28 | 3.1 | 2.6 | 17.5 | 2.2 |
| 1886 | 2.75 | 8.5 | 11.9 | 9.6 | 25.3 |
| 1887 | 0.36 | 3.4 | 5.6 | 12.6 | 3.4 |
| 1888 | 3.51 | 7.0 | 9.5 | 9.0 | 4.5 |
| 1889 | 1.37 | 3.3 | 6.3 | 12.7 | 1.0 |

### WEATHER SIGNALS.

The daily temperature and weather predictions of the chief signal officer have been distributed by this service to the following stations, where flags have been displayed for the benefit of the public.

The following are the percentages of correct predictions, both as to temperature and weather:

| STATION. | DISPLAYMAN. | WEATHER. | TEMP. |
|---|---|---|---|
| Arapahoe | J. W. Tomblin | 92.0 | 84.0 |
| Beatrice | F. H. Schmidt | 96.6 | 96.6 |
| Blair | J. H. Stewart & Co | 94.1 | 94.1 |
| Chester | Stephen Forsdick | 88.5 | 96.2 |
| Coleridge | F. L. Hicks | 88.5 | 88.5 |
| Craig | E. F. Irwin | | |
| David City | E. B. Taylor | 84.5 | 84.5 |
| Dwight | Geo. Ormsby | 100.0 | |
| Fairfield | J. C. Hodge | 76.2 | 88.5 |
| Falls City | A. B. Newkirk | 84.0 | 64.0 |
| Franklin | W. A. Harshbarger | 80.8 | 84.5 |
| Fremont | A. Truesdale | 87.1 | 67.7 |
| Gothenburg | L. G. Hutton | | |
| Grand Island | C. L. Howell | 80.0 | 83.3 |
| Hartington | U. K. Loose | 88.5 | 96.2 |
| Juniata | S. L. Bass | 92.3 | 84.5 |
| Lexington | Soren Jensen | 80.8 | 92.3 |
| Louisville | Thomas Shryock | 62.5 | 100.0 |
| Merna | M. Casteel | | |
| Niobrara | A. B. Yantis | 84.5 | 100.0 |
| Oakdale | The Sentinel | 83.3 | 75.0 |
| Osceola | E. A. Wahati | 91.7 | 87.5 |
| Paxton | R. D. Harris | 52.0 | 76.0 |
| Plattsmouth | J. N. Wise | 92.3 | 88.5 |
| Stromsburg | G. S. Osborn | 90.9 | 93.5 |
| Superior | G. J. Spoky | 88.5 | 96.2 |
| Syracuse | A. L. Alexander | | |
| Tobias | S. Larson | 80.8 | 88.5 |
| Western | J. R. Campbell | 96.2 | 65.4 |
| West Point | E. Briggs | 80.8 | 76.2 |

This gives, as the percentage of correct predictions of the state:

| | |
|---|---|
| Temperature | 86.1 |
| Weather | 85.3 |
| Mean | 85.7 |

## MONTHLY MISCELLANEOUS DATA.

| STATIONS. | OBSERVER. | TEMPERATURE OF THE AIR IN DEGREES FAHRENHEIT. *Monthly mean from—* Tri-daily observations... | Noon observations... | Max. and Min... | *Maximum*... | *Minimum*... | *Precipitation in inches.* Monthly, including melted snow... | Total monthly snow fall... | *No. rainy days .01 inch or more...* | *No. of cloudy days...* | *No. of fair days...* | *No. of clear days...* | *Prevailing direction of the wind...* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SOUTHEAST SECTION.** | | | | | | | | | | | | | |
| Ashland | Geo. Shedd | 43.3 | ...... | ...... | 71 | 11 | 0.63 | ...... | 3 | 4 | 9 | 18 | N |
| *Crete, *a* | G. I. Gilbert | 41.7 | ...... | 42.6 | 70 | 15 | 1.40 | ...... | 3 | 8 | 12 | 10 | NW |
| *Crete, *b* | Observer S. S | ...... | ...... | 42.6 | 70 | 15 | 1.42 | 0.30 | 4 | 10 | 10 | 11 | NW |
| David City | J. R. Townsend | ...... | ...... | ...... | 54 | 14 | 3.10 | 2.00 | 3 | ... | ...... | ...... | N |
| Fairbury | Dr. Humphrey | ...... | ...... | ...... | 70 | ...... | 1.75 | ...... | 4 | ... | ...... | ...... | ...... |
| *Falls City | A. B. Newkirk | 40.9 | ...... | 43.4 | 73 | 17 | 0.55 | ...... | 2 | 8 | 9 | 14 | N |
| *Lincoln | F. F. Almy | 42.2 | ...... | ...... | 69 | 9 | 1.01 | ...... | 4 | 5 | 6 | 20 | ...... |
| Marquette | John Ellis | ...... | 48.5 | ...... | 69 | 14 | 1.12 | 0.60 | 2 | ... | ...... | ...... | ...... |
| Minden | Joel Hull | 41.7 | 51.0 | ...... | 68 | 14 | 2.83 | 1.10 | 6 | 6 | 10 | 15 | N |
| Nebraska City | J. B. Parmelee | 42.5 | ...... | ...... | 70 | 16 | 0.68 | ...... | 3 | ... | ...... | ...... | ...... |
| Syracuse | P. W. Risser | 42.6 | ...... | ...... | 71 | 15 | 0.80 | ...... | 2 | ... | ...... | ...... | NW |
| Tecumseh | W. L. Dunlap | ...... | ...... | ...... | ... | ...... | ...... | ...... | ... | ... | ...... | ...... | ...... |
| Weeping Water | Geo. Treat | 42.1 | ...... | ...... | 75 | 18 | 0.75 | ...... | 4 | 2 | 17 | 8 | NW |
| Mean for section | ...... | 42.1 | ...... | ...... | ... | ...... | 1.37 | ...... | 3.3 | 6.3 | 11.2 | 12.7 | ...... |
| **NORTHEAST SECCTION.** | | | | | | | | | | | | | |
| Creighton | Dr. Geo. Roberts | 34.9 | ...... | 38.2 | 76 | 18 | 0.22 | ...... | 2 | 10 | 0 | 21 | NW |
| De Soto | Chas. Seltz | 41.7 | ...... | ...... | 71 | 17 | 0.53 | ...... | 8 | ... | ...... | ...... | N |
| Fremont | I. E. Heaton | 40.8 | ...... | 40.6 | 70 | 13 | 0.93 | 0.25 | 3 | ... | ...... | ...... | ...... |
| Oakdale | G. S. Clingman | 37.8 | ...... | 37.9 | 69 | 17 | 0.20 | ...... | 5 | 9 | 6 | 16 | NW |
| *Omaha | Observer S. S | 40.2 | ...... | 43.5 | 71 | 17 | 0.53 | ...... | 4 | 8 | 14 | 9 | N |
| Ponca | A. N. Porter | ...... | ...... | ...... | ... | ...... | ...... | ...... | ... | ... | ...... | ...... | ...... |
| West Point | E. G. Brunner | ...... | 50.2 | ...... | 73 | ...... | ...... | 1.00 | 4 | ... | ...... | ...... | NW |
| *Yankton, Dakota | Observer, S. S | 35.8 | ...... | 39.2 | 72 | 13 | 0.27 | ...... | 3 | 4 | 10 | 7 | NW |
| Mean for section | ...... | 38.5 | ...... | ...... | ... | ...... | 0.45 | ...... | 3.4 | 7.8 | 7.5 | 10.5 | ...... |
| Mean for East Neb | ...... | 40.3 | ...... | ...... | ... | ...... | 0.91 | ...... | 3.4 | 7.0 | 9.4 | 11.6 | ...... |
| **LOWER LOUP.** | | | | | | | | | | | | | |
| Genoa | G. S. Truman | 39.9 | ...... | ...... | 68 | 12 | 0.99 | 3.25 | 2 | 7 | 7 | 14 | N |
| North Loup | M. B. C. True | ...... | ...... | ...... | ... | ...... | ...... | ...... | ... | ... | ...... | ...... | ...... |
| Palmer | C. Shieldstream | 36.8 | ...... | ...... | 70 | 16 | 0.75 | ...... | 2 | ... | ...... | ...... | N |
| Ravenna | F. Smith | ...... | 51.6 | ...... | 67 | 17 | 1.45 | 0.50 | 7 | 3 | 12 | 16 | NW |
| West Hill | J. L. Trueman | 38.8 | ...... | ...... | 70 | 12 | 0.70 | 0.50 | 3 | 5 | 14 | 12 | NW |
| **UPPER LOUP.** | | | | | | | | | | | | | |
| Ansley | Peter Fowlie | 38.8 | ...... | 39.6 | 76 | 18 | 2.20 | ...... | 2 | ... | ...... | ...... | N |
| Sargent | J. R. Spooner | 37.0 | ...... | ...... | 68 | 14 | 0.78 | T | 3 | ... | ...... | ...... | NW |
| Mean for Loup section | ...... | 38.3 | ...... | ...... | ... | ...... | 1.14 | 1.00 | 3.2 | 5.0 | 11.0 | 14.0 | ...... |
| **NIOBRARA.** | | | | | | | | | | | | | |
| Fort Robinson | Hospital Steward | ...... | ...... | 33.4 | 70 | 18 | T | T | 0 | ... | ...... | ...... | N |
| Kennedy | Mrs. Erickson | 39.0 | ...... | ...... | 75 | 10 | 2.00 | 1.00 | 3 | 5 | 12 | 14 | NW |
| *Hay Springs | Wm. Waterman | 37.3 | ...... | 38.4 | 67 | 14 | 0.82 | 3.70 | 5 | 4 | 9 | 17 | N |
| *Valentine | Observer S. S | 39.2 | ...... | ...... | 71 | 21 | 1.19 | ...... | 4 | 9 | 5 | 17 | N |
| **REPUBLICAN.** | | | | | | | | | | | | | |
| Culbertson | G. D. Carrington | 38.2 | ...... | ...... | 75 | 14 | 1.22 | ...... | 3 | 8 | 4 | 19 | N |
| Franklin | W. A. Harshbarger | 46.5 | ...... | 40.8 | 74 | 18 | 2.15 | ...... | 6 | 7 | 7 | 9 | N |
| Red Willow | Mrs. R. Buck | ...... | ...... | ...... | ... | ...... | 1.54 | ...... | 6 | ... | ...... | ...... | ...... |
| **UPPER PLATTE.** | | | | | | | | | | | | | |
| *Kimball | Wm. G. Barton | ...... | ...... | ...... | ... | ...... | ...... | ...... | ... | ... | ...... | ...... | ...... |
| *North Platte | Observer S. S | 38.2 | ...... | 40.9 | 69 | 49 | 0.62 | ...... | 4 | 4 | 18 | 9 | N |
| Plum Creek | Geo. T. Cain | 46.5 | ...... | ...... | 75 | 20 | 1.38 | ...... | 3 | ... | ...... | ...... | N |
| Sidney | Oberfelder & Co. | ...... | ...... | ...... | ... | ...... | ...... | ...... | ... | ... | ...... | ...... | ...... |
| Mean for West Neb | ...... | 40.0 | ...... | ...... | ... | ...... | 1.21 | ...... | 3.7 | 6.2 | 9.2 | 11.2 | ...... |
| Mean for State | ...... | 39.7 | ...... | ...... | ... | ...... | 1.01 | ...... | 3.4 | 6.3 | 9.7 | 12.8 | N |

*Maximum and minimum temperature from self-registering thermometer. T in precipitation column indicates trace.

## APRIL.

The month of April has been a propitious one, as regards weather, the precipitation being about normal for most of the state, with an abundance of rain in the northern part, while the temperature has been rather above the normal, with an almost entire absence of freezing weather.

### TEMPERATURE.

The comparison of past Aprils shows only one with a higher mean temperature. There has been but one day below the freezing point in most parts of the state, and the present prospects for fruit and tender vegetation is good in nearly all parts of the state.

### PRECIPITATION.

The middle region of the Niobrara district was the center of greatest precipitation, reaching about six inches at Kennedy; the least precipitation was at Ansley, in the center of the state, amounting to only half an inch. The mean for southern Nebraska was a trifle less than normal, but the number of rainy and cloudy days was above the normal.

### NOTES FROM OBSERVERS.

"The present prospects are for a fine fruit crop."—G. Treat, Weeping Water.

"The month has been cool, but pleasant, very favorable for all crops. Corn planting is going on lively and soon will be a thing of the past, if this weather continues."—P. W. Risser, Syracuse.

"The most noteworthy features of the month have been the large amount of clouds, the small amount of electricity, and the small rainfall, often none from highly threatening clouds, yet the amount that has fallen has enabled the farmers to get in their small grain in good season and shape, and a larger acreage than usual."—Geo. Shedd, Ashland.

"Winter wheat excellent, grass good, weather and ground favorable for farming. Farmers well ahead in their work. 'An extensive area planted in corn during this month."—W. L. Dunlap, Tecumseh.

"Dust storms very frequent. Several frosts, but very little if any injury has been done to vegetation."—J. W. Reynolds, Fort Robinson.

"The frost of the 29th has probably destroyed all the fruit buds in this region, at least plum and cherry.—Mrs. M. G. Erickson.

"The past month has been very favorable for wheat. Oats are also growing finely."—Wm. Waterman, Hay Springs.

"The most notable occurrence was the gale on the 2d, from the northwest, followed that evening by a cold wave. Owing to the exceedingly dry weather just preceding, it caused the worst sand storm that has occurred lately, and the most devastating and extensive prairie fires known for years. There have been no killing frosts."—G. S. Clingman, Oakdale.

### TABLES.

The following are the total number of miles traveled by the wind during the month, the maximum and average velocity per hour, the mean humidity of the air, and the monthly mean barometer:

| STATION. | MILES. | MAX. | MEAN. | HUM. | BAR. |
|---|---|---|---|---|---|
| Crete | 9,276 | 56 | 12.9 | | 30.07 |
| Lincoln | 11,678 | 55 | 16.2 | | |
| North Platte | 8,201 | 48 | 11.4 | 63 | 30.06 |
| Omaha | 6,856 | 45 | 9.5 | 54 | 30.05 |
| Valentine | 8,480 | 56 | 11.8 | 66 | 30.02 |
| Yankton, Dakota | 7,514 | 48 | 10.4 | 53 | |

### COMPARISON OF PAST APRILS.

The table shows the mean temperature and the number of days below 32 degrees for the past twelve Aprils, in southeastern Nebraska; they are found by averaging the numbers reported at the different stations. It also shows the highest temperature and the lowest recorded anywhere in the state by standard self-registering thermometers:

| APRIL. | MEAN TEMP. | BELOW 32° | HIGHEST TEMP. | LOWEST TEMP. |
|---|---|---|---|---|
| 1878 | 53.0 | 4.4 | 82.0 | 34.0 |
| 1879 | 52.0 | 5.5 | 80.0 | 13.0 |
| 1880 | 51.3 | 5.2 | 91.0 | 20.0 |
| 1881 | 45.1 | 9.8 | 81.0 | 6.0 |
| 1882 | 51.4 | 3.9 | 87.0 | 25.0 |
| 1883 | 52.3 | 3.2 | 95.0 | 29.0 |
| 1884 | 49.4 | 10.2 | 80.6 | 22.0 |
| 1885 | 49.2 | 4.8 | 84.0 | 20.0 |
| 1886 | 50.4 | 6.7 | 85.0 | 16.0 |
| 1887 | 58.5 | 5.6 | 93.0 | 14.0 |
| 1888 | 56.6 | 1.3 | 89.0 | 21.0 |
| 1889 | 52.3 | 1.0 | 87.0 | 13.0 |

The following table shows the precipitation, or depth in inches, of rain and melted snow or hail, the number of days on which it fell, and the number of cloudy and of clear days. Days are counted cloudy when the sky is four-fifths overcast; clear when less than one-third:

| APRIL. | PRECIPITATION. | DAYS OF PRECIP. | CLOUDY DAYS. | CLEAR DAYS. |
|---|---|---|---|---|
| 1878 | 2.42 | 6.2 | 6.4 | 16.2 |
| 1879 | 3.11 | 7.4 | 5.4 | 12.6 |
| 1880 | 0.82 | 2.3 | 2.6 | 17.0 |
| 1881 | 2.91 | 7.4 | 6.8 | 9.1 |
| 1882 | 4.80 | 7.3 | 9.2 | 8.7 |
| 1883 | 2.43 | 8.0 | 5.2 | 9.8 |
| 1884 | 2.91 | 7.4 | 10.0 | 7.5 |
| 1885 | 4.29 | 10.1 | 7.8 | 9.0 |
| 1886 | 2.78 | 9.7 | 7.7 | 9.7 |
| 1887 | 1.62 | 7.5 | 5.8 | 11.6 |
| 1888 | 2.57 | 6.1 | 6.2 | 10.8 |
| 1889 | 2.50 | 7.8 | 9.4 | 12.8 |

### WEATHER SIGNALS.

The daily temperature and predictions of the chief signal officer have been distributed by this service to the following stations, where flags have been displayed for the benefit of the public.

The following are the percentages of correct predictions both as to temperature and weather:

| STATION. | DISPLAYMAN. | WEATHER. | TEMP. |
|---|---|---|---|
| Arapahoe | J. W. Tomblin | 96.0 | 95.7 |
| Beatrice | F. H. Schmidt | 95.4 | 92.3 |
| Blair | J. H. Stewart & Co. | 88.4 | 88.4 |
| Chester | Stephen Forsdick | 88.4 | 80.8 |
| Coleridge | F. L. Hicks | 88.4 | 92.3 |
| Craig | E. F. Irwin | 76.9 | 84.6 |
| David City | E. B. Taylor | 84.6 | 88.4 |
| Fairfield | J. C. Hodge | 92.3 | 88.4 |
| Franklin | W. A. Harshbarger | 92.3 | 84.0 |
| Fremont | A. Truesdale | 95.4 | 95.4 |
| Gibbon | C. M. Brooke | 88.4 | 65.4 |
| Gothenburg | L. G. Hutton | 50.0 | 50.0 |
| Hartington | U. K. Loose | 80.0 | 91.6 |
| Juniata | S. L. Brass | 95.4 | 100.0 |
| Lexington | Soren Jensen | 100.0 | 92.3 |
| Louisville | Thomas Shryock | 76.9 | 88.4 |
| Merna | M. Casteel | ........ | ........ |
| Niobrara | A. B. Yantis | 88.4 | 100.0 |
| Oakdale | The Sentinel | 76.9 | 65.4 |
| Osceola | E. A. Wahatl | 92.3 | 92.3 |
| Plattsmouth | J. N. Wise | 96.3 | 95.4 |
| Paxton | R. D. Harris | 88.4 | 73.1 |
| Seward | J. Kittle | 92.0 | 92.0 |
| Stromsburg | G. S. Osborn | 80.8 | 84.6 |
| Superior | G. J. Spoky | 95.4 | 88.4 |
| Syracuse | A. L. Alexander | 76.9 | 92.3 |
| Tobias | S. Larson | 84.6 | 95.4 |
| Western | J. R. Campbell | 92.3 | 61.5 |
| West Point | E. Briggs | 76.9 | 73.1 |

This gives as the percentage of correct predictions of the state:

| | |
|---|---|
| Temperature | 86.5 |
| Weather | 86.6 |
| Mean | 86.55 |

## MONTHLY MISCELLANEOUS DATA.

| STATIONS. | OBSERVERS. | TEMPERATURE OF THE AIR IN DEGREES FAHRENHEIT. Monthly mean from— Tri-daily observations... | Noon Observations....... | Max. and Min.......... | Maximum............... | Minimum.............. | *Precipitation in inches.* Monthly, including melted snow....... | Total monthly snow fall.............. | *No. rainy days, .01 inch or more..* | *No. of cloudy days......................* | *No. of fair days.........................* | *No. of clear days.........................* | *Prevailing direction of the wind.* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SOUTHEAST SECTION.** | | | | | | | | | | | | | |
| **Ashland** | Geo. Shedd | 51.7 | ...... | ...... | 81 | 30 | 1.29 | ...... | 7 | 8 | 7 | 15 | N |
| ***Crete, *a*** | G. I. Gilbert | 53.4 | ...... | 54.0 | 82 | 27 | 2.70 | ...... | 10 | 9 | 11 | 11 | NW |
| ***Crete, *b*** | Observer S. S. | ...... | ...... | 54.0 | 82 | 27 | 2.70 | ...... | 10 | 13 | 6 | 11 | E |
| **David City** | E. B. Taylor | 45.5 | ...... | ...... | ... | ...... | 2.48 | ...... | 9 | ... | ...... | ...... | SE |
| **Fairbury** | Dr. Humphrey | ...... | ...... | ...... | 83 | 32 | 1.81 | ...... | 8 | ... | ...... | ...... | ...... |
| ***Falls City** | A. B. Newkirk | ...... | ...... | ...... | ... | ...... | ...... | ...... | ... | ... | ...... | ...... | ...... |
| ***Lincoln** | F. F. Almy | 53.0 | ...... | ...... | 79 | 24 | 2.28 | ...... | 9 | 9 | 7 | 14 | S |
| **Marquette** | John Ellis | ...... | 61.4 | ...... | 85 | 28 | 2.14 | ...... | 6 | ... | ...... | ...... | ...... |
| **Minden** | Joel Hull | 54.2 | ...... | ...... | 84 | 30 | 2.81 | ...... | 8 | 11 | 9 | 10 | N |
| **Nebraska City** | J. B. Parmelee | 53.7 | ...... | ...... | 83 | 31 | 1.80 | ...... | 4 | ... | ...... | ...... | ...... |
| **Syracuse** | P. W. Risser | 53.8 | ...... | 55.0 | 81 | 36 | 2.18 | ...... | 9 | ... | ...... | ...... | ...... |
| **Tecumseh** | W. L. Dunlap | ...... | ...... | 53.5 | 76 | 35 | 2.27 | ...... | 4 | ... | ...... | ...... | ...... |
| **Weeping Water** | Geo. Treat | 50.3 | ...... | ...... | 84 | 28 | 1.25 | ...... | 10 | 6 | 10 | 14 | SE |
| **Weston** | J. R. Campbell | 55.6 | ...... | ...... | 83 | 32 | 1.78 | ...... | 9 | ... | ...... | ...... | N |
| **Mean for section** | ...... | 52.3 | ...... | 54.1 | ... | ...... | 2.50 | ...... | 7.8 | 9.4 | 7.8 | 12.8 | ...... |
| **NORTHEAST SECTION.** | | | | | | | | | | | | | |
| **†Craig** | E. F. Irwin | 53.5 | ...... | ...... | 82 | 34 | 0.57 | ...... | 6 | 5 | 5 | 8 | NW |
| **Creighton** | Dr. Geo. Roberts | 48.3 | ...... | 50.5 | 87 | 25 | 2.62 | ...... | 5 | 5 | 9 | 16 | NW |
| **De Soto** | Chas. Seltz | 53.8 | ...... | ...... | 84 | 31 | 1.22 | ...... | 10 | ... | ...... | ...... | N |
| **Fremont** | I. E. Heaton | 53.7 | ...... | 53.4 | 79 | 30 | 1.73 | ...... | 6 | ... | ...... | ...... | ...... |
| **Oakdale** | G. S. Clingman | 50.7 | ...... | 51.1 | 84 | 27 | 1.68 | ...... | 6 | 12 | 8 | 10 | NW |
| ***Omaha** | Observer S. S. | 52.4 | ...... | 54.0 | 80 | 32 | 1.19 | ...... | 10 | 13 | 10 | 7 | N |
| **Ponca** | A. N. Porter | ...... | ...... | ...... | ... | ...... | ...... | ...... | ... | ... | ...... | ...... | ...... |
| **West Point** | E. G. Bruner | ...... | 62.8 | ...... | 82 | ...... | 1.70 | ...... | 4 | ... | ...... | ...... | N |
| ***Yankton, Dakota** | Observer S. S. | 50.8 | ...... | ...... | 81 | 22 | 1.46 | ...... | 6 | 6 | 13 | 11 | NW |
| **Mean for section** | ...... | 51.9 | ...... | 52.2 | ... | ...... | 1.52 | ...... | 6.6 | 8.2 | 9.0 | 10.2 | ...... |
| **Mean for East Neb** | ...... | 52.1 | ...... | 53.2 | ... | ...... | 2.01 | ...... | 7.2 | 8.8 | 8.2 | 11.5 | ...... |
| **LOWER LOUP.** | | | | | | | | | | | | | |
| **Genoa** | G. S. Truman | ...... | ...... | 52.9 | 79 | 29 | 2.21 | ...... | 4 | 12 | 4 | 13 | ...... |
| **North Loup** | M. B. C. True | 51.5 | ...... | ...... | 80 | 27 | 1.88 | ...... | 8 | ... | ...... | ...... | ...... |
| **Palmer** | C. Shieldstream | 49.2 | ...... | ...... | 80 | 28 | 2.50 | ...... | 3 | ... | ...... | ...... | S |
| **Ravenna** | E. Smith | ...... | 61.6 | ...... | 79 | 27 | 2.03 | ...... | 7 | 10 | 8 | 12 | S |
| **West Hill** | J. L. Truman | 52.1 | ...... | ...... | 82 | 30 | 2.10 | ...... | 5 | 11 | 6 | 13 | NW |
| **UPPER LOUP.** | | | | | | | | | | | | | |
| **Ansley** | Peter Fowlie | 48.6 | ...... | 50.5 | 83 | 25 | 0.50 | ...... | 2 | ... | ...... | ...... | N |
| **Sargent** | J. S. Spooner | 48.9 | ...... | ...... | 83 | 29 | 1.50 | ...... | 9 | ... | ...... | ...... | NW |
| **Mean for Loup section** | ...... | 50.1 | ...... | 51.7 | ... | ...... | 1.82 | ...... | 5.4 | 11 | 6.0 | 12.7 | ...... |
| **NIOBRARA.** | | | | | | | | | | | | | |
| **Fort Robinson** | Hospital Steward | ...... | ...... | 50.3 | 82 | 13 | 1.39 | ...... | 9 | ... | ...... | ...... | NW |
| **Kennedy** | Mrs. Erickson | 50.0 | ...... | ...... | 86 | 24 | 5.94 | 2.00 | 11 | 8 | 9 | 13 | NW |
| ***Hay Springs** | Wm. Waterman | 47.3 | ...... | 48.2 | 78 | 19 | 2.27 | 3.00 | 8 | 8 | 10 | 12 | NW |
| ***Valentine** | Observer S. S. | 50.4 | ...... | 51.8 | 82 | 23 | 3.87 | ...... | 9 | 10 | 6 | 14 | N |
| **REPUBLICAN.** | | | | | | | | | | | | | |
| **‡Culbertson** | G. D. Carrington | ...... | ...... | ...... | 86 | 28 | 1.62 | ...... | 6 | 9 | 4 | 11 | ...... |
| **Franklin** | W. A. Harshbarger | 51.0 | ...... | 53.1 | 85 | 30 | 2.09 | ...... | 8 | 13 | 8 | 9 | N |
| **Red Willow** | Mrs. R. Buck | ...... | ...... | ...... | ... | ...... | 2.28 | ...... | 7 | ... | ...... | ...... | ...... |
| **UPPER PLATTE.** | | | | | | | | | | | | | |
| ***Kimball** | Wm. G. Barton | ...... | ...... | ...... | ... | ...... | ...... | ...... | ... | ... | ...... | ...... | ...... |
| ***North Platte** | Observer S. S. | 49.6 | ...... | 50.6 | 84 | 24 | 2.65 | ...... | 9 | 12 | 9 | 9 | SE |
| **Plum Creek** | Geo. T. Cain | 52.0 | ...... | ...... | 87 | 31 | 2.33 | ...... | 9 | ... | ...... | ...... | NW |
| **Sidney** | Oberfelder & Co. | ...... | ...... | ...... | ... | ...... | ...... | ...... | ... | ... | ...... | ...... | ...... |
| **Mean for West Neb** | ...... | 49.7 | ...... | 50.9 | ... | ...... | 2.76 | ...... | 8.4 | 10 | 7.7 | 11.3 | ...... |
| **Mean for State** | ...... | 51.0 | ...... | 52.2 | ... | ...... | 2.15 | ...... | 7.0 | 9.6 | 7.6 | 11.7 | NW |

***Maximum and minimum temperature from self-registering thermometer. T in precipitation column indicates trace. †For nineteen days. ‡For twenty-four days.**

## MAY.

The temperature for the month of May has been very nearly normal, with abundant rainfall over the state generally excepting the central portion.

### TEMPERATURE.

The temperature of the month for southeastern Nebraska was 62.1 degrees, which is only slightly above the normal; there were less than the usual number of hot days, while there has been an almost entire absence of freezing weather, only slight damage to vegetation being anywhere reported in the state.

### PRECIPITATION.

The rainfall for May shows considerable resemblance to that for April; the region of least rainfall in both cases is in the central part of the state. At Ravenna, for example, the normal rainfall for the two months for twelve years is 6.4 inches; for the past two months it has amounted to 3.5 inches. From North Loup, where the rainfall for the past month was less than an inch, it increased rapidly and somewhat regularly to the southeast, reaching a maximum of nearly eight inches at Fairbury. The northwestern part of the state has received about three inches.

There has not been so great a deficiency in rainy days as in amount of rain. Except in a limited area in the central part of the state, the crops are reported as looking unusually well.

### NOTES FROM OBSERVERS.

"The month has been cool and wet. Corn growingslowly. Potatoes, oats, rye, and wheat doing well."—G. D. CARRINGTON, Brownville.

"Crops of all kind are doing well; some complaint of poor stand of corn. Fruit prospect good."—G. TREAT, Weeping Water.

"Crops in northern part of the county suffering for rain."—E. B. TAYLOR, David City.

"The month has been generally cool, but all crop prospects are very good."—P. W. RISSER, Syracuse.

"Month rather cool. Cut worms numerous and destructive. A fine stand of corn. Apples and cherries abundant. Winter wheat in prime condition. Strawberries injured by frost and crop short."—W. L. DUNLAP, Tecumseh.

"The month of May has been favorable for all crops. An unusual rainfall, having been excelled but once in fifteen years; that was in 1877, when 10.66 inches fell. The ground is now thoroughly saturated and warm enough to push all crops."—DR. HUMPHREY, Fairbury.

"Corn and potatoes slightly injured by the frost of the 30th. The low temperature since the 10th has kept corn and potatoes from making usual growth, while it has been beneficial to the grass and grain crops. The outlook is good for full average crops."—JOEL HULL, Minden.

"The month has been uncommonly cool and dry, although the temperature has been 5.8 degrees above the mean of last year, but 5.3 degrees below the mean for May for the past ten years."—G. S. TRUMAN, Genoa.

"The precipitation has been below normal, but sufficient to keep crops from suffering."—G. S. CLINGMAN, Oakdale.

"The weather has been favorable for the growth of trees planted on tree claims.

Corn looks rather yellow. Those who have lived here the longest say that the spring rainfall has increased steadily every year; that six or eight years ago, March, April, and May were very dry months and the sand hills presented a much more barren appearance."—MRS. M. G. ERICKSON, Kennedy.

"The month has been quite cool and cloudy though not enough rain has fallen. All grain needs more rain and warm weather."—E. F. ERWIN, Craig.

### TABLES.

The following are the total number of miles traveled by the wind during the month, the maximum and average velocity per hour, the mean humidity of the air, and the monthly mean barometer:

| STATION. | MILES. | MAX. | MEAN. | HUM. | BAR. |
|---|---|---|---|---|---|
| Crete | ........ | ........ | ........ | ........ | ........ |
| Lincoln | ........ | ........ | ........ | ........ | ........ |
| North Platte | 8064 | 40 | 10.8 | 62 | 29.95 |
| Omaha | 7409 | 46 | 9.1 | 55 | 29.94 |
| Valentine | 7995 | 50 | 10.7 | ........ | 29.94 |
| Yankton, Dakota | 6584 | 56 | 8.8 | 54 | 29.93 |

### COMPARISON OF PAST MAYS.

The table shows the mean temperature, the number of days below 32 degrees and above 85 degrees for the past twelve Mays in southeastern Nebraska; they are found by averaging the number reported at the different stations. It also shows the highest temperature and the lowest recorded anywhere in the state by standard self-registering thermometers:

| MAY. | MEAN TEMP. | BELOW 32° | ABOVE 85° | HIGHEST TEMP. | LOWEST TEMP. |
|---|---|---|---|---|---|
| 1878 | 55.8 | 2.7 | ........ | ........ | ........ |
| 1879 | 64.8 | 1.6 | 7.4 | 91.0 | 32.0 |
| 1880 | 67.2 | 0.4 | 10.2 | 94.0 | 37.0 |
| 1881 | 67.2 | 6.0 | 6.3 | 90.0 | 44.0 |
| 1882 | 56.4 | 2.1 | 1.0 | 89.0 | 35.0 |
| 1883 | 58.5 | 1.4 | 1.6 | 93.0 | 35.0 |
| 1884 | 59.8 | 0.4 | 0.8 | 88.0 | 32.0 |
| 1885 | 58.3 | 4.2 | 1.0 | 86.0 | 29.0 |
| 1886 | 65.0 | 0.8 | 6.9 | 93.0 | 25.0 |
| 1887 | 65.2 | 2.0 | 6.6 | 94.0 | 22.0 |
| 1888 | 57.4 | 0.2 | 0.2 | 82.0 | 27.0 |
| 1889 | 62.1 | 0.1 | 2.0 | 95.0 | 22.0 |

The following table shows the precipitation, or depth in inches, of rain and melted snow or hail, the number of cloudy and of clear days. Days are counted cloudy when the sky is four-fifths overcast:

| MAY. | PRECIPITATION. | DAYS OF PRECIP. | CLOUDY DAYS. | CLEAR DAYS. |
|---|---|---|---|---|
| 1878 | 4.48 | 8.6 | 7.9 | 11.6 |
| 1879 | 4.02 | 7.5 | 4.4 | 11.8 |
| 1880 | 2.62 | 5.2 | 3.6 | 14.5 |
| 1881 | 6.94 | 10.3 | 7.5 | 4.6 |
| 1882 | 4.44 | 11.2 | 11.5 | 5.8 |
| 1883 | 5.65 | 11.7 | 8.6 | 7.0 |
| 1884 | 2.76 | 7.3 | 6.5 | 11.2 |
| 1885 | 4.11 | 8.2 | 6.0 | 13.7 |
| 1886 | 4.55 | 11.0 | 3.8 | 14.1 |
| 1887 | 3.04 | 7.3 | 3.6 | 17.4 |
| 1888 | 5.74 | 10.9 | 10.6 | 11.3 |
| 1889 | 4.36 | 9.3 | 8.8 | 11.3 |

## WEATHER SIGNALS.

The daily temperature and weather predictions of the chief signal officer have been distributed by this service to the following stations, where flags have been displayed for the benefit of the public.

The following are the percentages of correct predictions both as to temperature and weather:

| STATION. | DISPLAYMAN. | WEATHER. | TEMP. |
|---|---|---|---|
| Arapahoe | J. W. Tomblin | 84.5 | 85.2 |
| Beatrice | F. H. Schmidt | 85.2 | 96.1 |
| Blair | J. H. Stewart & Co | 90.9 | 90.9 |
| Chester | Stephen Forsdick | 77.8 | 92.6 |
| Coleridge | F. L. Hicks | 84.5 | 100.0 |
| Craig | E. F. Erwin | 84.5 | 92.3 |
| David City | E. B. Taylor | 80.8 | 100.0 |
| Dwight | Geo. Ormsby | 77.8 | 77.8 |
| Fairfield | J. C. Hodge | 88.5 | 92.3 |
| Falls City | A. B. Newkirk | 57.7 | 84.5 |
| Franklin | W. A. Harshbarger | 80.0 | 96.0 |
| Fremont | A. Truesdale | 100.0 | 100.0 |
| Gibbon | C. M. Brooke | 92.6 | 92.6 |
| Gothenburg | L. G. Hutton | 64.5 | 46.1 |
| Grand Island | C. S. Howell | | |
| Hartington | U. K. Loose | 85.2 | 96.1 |
| Holdrege | J. D. Cogswell | 93.8 | 87.5 |
| Juniata | S. L. Brass | 85.2 | 92.6 |
| Lexington | Soren Jensen | | |
| Louisville | Thomas Shryock | 76.0 | 96.0 |
| Merna | M. Casteel | | |
| Nebraska City | J. B. Parmelee | | |
| Niobrara | A. B. Yantis | 80.8 | 100.0 |
| Oakdale | The Sentinel | 76.9 | 88.5 |
| Osceola | E. A. Wahatl | | |
| Paxton | R. D. Harris | 79.1 | 91.7 |
| Plattsmouth | J. N. Wise | 92.3 | 84.5 |
| Stromsburg | G. S. Osborn | | |
| Superior | G. J. Spoky | 100.0 | 96.1 |
| Syracuse | A. L. Alexander | 92.6 | 96.3 |
| Tobias | S. Larson | 69.2 | 96.1 |
| Western | J. R. Campbell | 88.5 | 84.5 |
| West Point | E. Briggs | 74.1 | 92.6 |

This gives as the percentage of correct predictions of the state:

| | |
|---|---|
| Temperature | 90.7 |
| Weather | 83.1 |
| Mean | 86.9 |

## MONTHLY MISCELLANEOUS DATA.

| STATIONS. | OBSERVERS. | TEMPERATURE OF THE AIR IN DEGREES FAHRENHEIT. | | | | | *Precipitation in inches.* | | *No. of rainy days, .01 inch or more.* | *No. of cloudy days.* | *No. of fair days.* | *No. of clear days.* | *Prevailing direction of the wind.* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Monthly mean from—* | | | *Maximum.* | *Minimum.* | Monthly, including melted snow. | Total monthly snow fall. | | | | | |
| | | Tri-daily observations. | Noon observations. | Max. and Min. | | | | | | | | | |
| SOUTHEAST SECTION. | | | | | | | | | | | | | |
| Ashland | Geo. Shedd | 63.7 | ...... | ...... | 93 | 32 | 2.93 | ...... | 9 | 7 | 2 | 22 | N |
| Brownville | G. D. Carrington | 65.0 | 71.9 | ...... | 90 | 33 | 5.91 | ...... | 12 | 10 | 7 | 14 | ...... |
| *Crete, *a* | G. I. Gilbert | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| *Crete, *b* | Observer S. S. | ...... | ...... | 61.0 | 89 | 32 | 4.46 | ...... | 14 | 8 | 16 | 7 | N |
| David City | E. B. Taylor | 55.0 | ...... | ...... | 86 | 34 | 2.43 | ...... | 4 | ...... | ...... | ...... | NW |
| Fairbury | Dr. Humphrey | ...... | ...... | ...... | 89 | 42 | 7.79 | ...... | ...... | ...... | ...... | ...... | ...... |
| *Falls City | A. B. Newkirk | 61.9 | ...... | 64.2 | 92 | 33 | 6.55 | ...... | 6 | 12 | 11 | 8 | N |
| *Lincoln | F. F. Almy | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Marquette, *a* | John Ellis | ...... | 67.6 | ...... | 95 | 32 | 2.12 | ...... | 7 | ...... | ...... | ...... | ...... |
| Marquette, *b* | J. Pinkerton | ...... | 66.7 | ...... | 90 | 32 | 2.13 | ...... | 7 | ...... | ...... | ...... | ...... |
| Minden | Joel Hull | 58.8 | 68.2 | ...... | 92 | 40 | 5.24 | ...... | 10 | 7 | 15 | 9 | N |
| Nebraska City | J. B. Parmelee | 63.5 | ...... | ...... | 86 | 32 | 4.26 | ...... | 10 | ...... | ...... | ...... | ...... |
| Syracuse | P. W. Risser | 63.6 | ...... | 65.6 | 90 | 40 | 3.39 | ...... | 8 | ...... | ...... | ...... | ...... |
| Tecumseh | W. L. Dunlap | ...... | ...... | 62.8 | 87 | 32 | 5.42 | ...... | 8 | 9 | 14 | 8 | NW |
| Weeping Water | Geo. Treat | 65.0 | ...... | ...... | 94 | 29 | 5.12 | ...... | 12 | ...... | ...... | ...... | NE |
| Weston | J. R. Campbell | 62.0 | ...... | ...... | 90 | 40 | 3.00 | ...... | 12 | ...... | ...... | ...... | N |
| Mean for section | ...... | 62.1 | ...... | 63.4 | ...... | ... | 4.36 | ...... | 9.3 | 8.8 | 10.8 | 11.3 | ...... |
| NORTHEAST SECTION. | | | | | | | | | | | | | |
| Craig | E. F. Irwin | 62.0 | ...... | ...... | 87 | 40 | 2.80 | ...... | 9 | 18 | 0 | 13 | NW |
| Creighton | Dr. Geo. Roberts | 55.9 | ...... | ...... | 94 | 26 | 2.12 | ...... | 9 | ...... | ...... | ...... | NW |
| De Soto | Chas. Seltz | 61.6 | ...... | ...... | 93 | 31 | 2.94 | ...... | 11 | ...... | ...... | ...... | N |
| Fremont | I. E. Heaton | 58.7 | ...... | 60.4 | 91 | 37 | 2.41 | ...... | 9 | ...... | ...... | ...... | ...... |
| Oakdale | G. S. Clingman | 57.7 | ...... | 58.0 | 94 | 25 | 1.57 | ...... | 11 | 11 | 8 | 12 | N |
| *Omaha | Observer S. S. | 61.6 | ...... | 62.5 | 90 | 37 | 2.67 | ...... | 11 | 10 | 12 | 9 | N |
| Ponca | A. N. Porter | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Stuart | C. E. Barber | 59.7 | ...... | 59.3 | 88 | 26 | 2.32 | ...... | 6 | ...... | ...... | ...... | NW |
| West Point | E. G. Bruner | ...... | 68.7 | ...... | 82 | ... | 1.90 | ...... | 6 | ...... | ...... | ...... | N |
| *Yankton, Dakota | Observer S. S. | 58.8 | ...... | ...... | 94 | 30 | 1.72 | ...... | 14 | 6 | 15 | 10 | NW |
| Mean for section | ...... | 59.5 | ...... | 60.0 | ...... | ... | 2.27 | ...... | 9.6 | 11.0 | 8.7 | 11.0 | ...... |
| Mean for East Neb | ...... | 60.8 | ...... | 61.7 | ...... | ... | 3.31 | ...... | 9.4 | 10.0 | 9.8 | 11.2 | ...... |
| LOWER LOUP. | | | | | | | | | | | | | |
| Genoa | G. S. Truman | 60.7 | ...... | 60.2 | 91 | 30 | 2.02 | ...... | 7 | 11 | 6 | 7 | NW |
| North Loup | M. B. C. True | 56.9 | ...... | ...... | 91 | 24 | 0.98 | ...... | 8 | ...... | ...... | ...... | ...... |
| Palmer | C. Shieldstream | 57.7 | ...... | ...... | 92 | 25 | 1.00 | ...... | 5 | ...... | ...... | ...... | S |
| Ravenna | E. Smith | ...... | 69.3 | ...... | 88 | 26 | 1.43 | ...... | 9 | 8 | 13 | 10 | ...... |
| West Hill | J. L. Truman | 60.6 | ...... | ...... | 93 | 40 | 1.67 | ...... | 9 | 11 | 16 | 4 | NW |
| UPPER LOUP. | | | | | | | | | | | | | |
| Ansley | Peter Fowlie | 57.0 | ...... | 60.0 | 95 | 31 | 1.50 | ...... | 4 | ...... | ...... | ...... | N |
| Sargent | J. S. Spooner | 58.1 | ...... | ...... | 94 | 35 | 1.03 | ...... | 6 | ...... | ...... | ...... | NE |
| Mean for Loup section. | ...... | 58.5 | ...... | 60.1 | ...... | ... | 1.38 | ...... | 6.9 | 10.0 | 11.7 | 7.0 | ...... |
| NIOBRARA. | | | | | | | | | | | | | |
| Fort Robinson | Hospital Steward | ...... | ...... | 53.4 | 89 | 22 | 2.59 | ...... | 16 | ...... | ...... | ...... | N |
| Kennedy | Mrs. Erickson | 54.8 | ...... | ...... | 94 | 28 | 3.38 | ...... | 6 | 8 | 10 | 13 | N |
| *Hay Springs | Wm. Waterman | 52.1 | ...... | 52.0 | 82 | 26 | 3.66 | ...... | 10 | 9 | 12 | 10 | N |
| *Valentine | Observer S. S. | 54.0 | ...... | ...... | 84 | 23 | 2.05 | ...... | 12 | 13 | 5 | 13 | N |
| REPUBLICAN. | | | | | | | | | | | | | |
| ‡Culbertson | Mrs. Wilbley | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Franklin | W. A. Harshbarger | 59.3 | ...... | 59.6 | 90 | 34 | 5.28 | ...... | 9 | 13 | 10 | 8 | NE |
| Red Willow | Mrs. R. Buck | ...... | ...... | ...... | ...... | ... | 2.00 | ...... | 8 | ...... | ...... | ...... | ...... |
| UPPER PLATTE. | | | | | | | | | | | | | |
| Geriny | J. P. Finley | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| †*Kimball | Wm. G. Barton | ...... | ...... | 54.0 | 86 | 32 | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Lexington | Geo. T. Cain | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| *North Platte | Observer S. S. | 55.8 | ...... | 56.3 | 89 | 25 | 2.71 | ...... | 12 | 10 | 17 | 4 | N |
| Sidney | Oberfelder & Co. | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Mean for West Neb | ...... | 55.2 | ...... | 55.4 | ...... | ... | 3.10 | ...... | 10.4 | 11.0 | 10.8 | 9.6 | ...... |
| Mean for State | ...... | 58.8 | ...... | 59.6 | ...... | ... | 2.78 | ...... | 9.0 | 10.0 | 10.5 | 9.7 | N |

**☞ * Maximum and minimum temperature from self-registering thermometer. T in precipitation column indicates trace. †* For 25 days.**

## JUNE.

The month of June has been slightly below normal in temperature, but with a few extremely hot days; the precipitation has also been above normal and has been most abundant in the parts of the state which in May had a deficiency.

### TEMPERATURE.

The mean temperature for southeastern Nebraska has been sixty-nine degrees, and the maximum for the entire state one hundred and four degrees, which has not been exceeded in previous years. A slight froston June 4 was reported at Hay Springs.

### PRECIPITATION.

The map of rainfall shows an exceedingly large range in the amount of precipitation, from less than an inch at Fairbury to over nine at West Point. Last month Fairbury had the maximum precipitation of the state, over seven inches, and the Elkhorn valley nearly the minimum. The mean for the state was nearly four inches, which is more than an inch above the normal for June. The number of rainy days has also been large. This makes the prospect for corn good, although the fact that it has been a good while since the ground was thoroughly and deeply saturated makes the crop dependent upon a due amount of precipitation in July or August to insure a crop.

### NOTES FROM OBSERVERS.

"Crops of most kinds are in fine condition. Fine growing weather with many gentle rains."—G. TREAT, Weeping Water.

"The rains of this month have assured good crops in this section, and also thoroughly soaked up the ground. The last ten days have been characterized by excessive dews at night."—E. F. IRWIN, Craig.

"The very abundant rains of the month, together with the sunshine and warmth, are giving a wonderful crop of early potatoes and other early vegetables, also early fruits, and likewise giving one of the very best prospects for a large corn crop ever witnessed in this section at this season of the year."—GEO. SHEDD, Ashland.

"The weather has been very favorable for all crops. The rainfall, though sufficient, was considerably below the normal for this station."—W. L. DUNLAP, Tecumseh.

"No great extremes of temperature, 90° being the highest. All crops doing well; plenty of rain, well distributed. Heavy rain on the 20th, when six-tenths fell in twenty minutes."—G. D. CARRINGTON, Brownville.

"The rainfall has been abundant, and has kept the crops in good condition; 2.65 inches of rain fell in three and a half hours on the 20th."—G. S. CLINGMAN, Oakdale.

"Rye ready to cut, other small grain doing well; corn growing fast."—C. SHIELDSTREAM, Palmer.

"Rainfall for June, '89, 4.02; normal for twelve years, 3.63. Rainfall for April, May, and June, '89, 7.46; twelve-year normal for same period, 10.03, showing a deficiency for the three months of 2.57."—ERASTUS SMITH, Ravenna.

"The month has been remarkably pleasant; not a great amount of rain has fallen, still it seems to be sufficient, for crops were never looking better at this season of the year. Corn was backward first of the month, but the hot days of the latter part have brought it up to about the usual stand and it is very free from weeds, and making rapid growth, as are also the young trees on timber claims."—MRS. L. A. WIBLEY, Culbertson.

"From all information received, crops in this section are doing well."—S. W. REYNOLDS, Fort Robinson.

### TABLES.

The following are the total number of miles traveled by the wind during the month, the maximum and average velocity per hour, the mean humidity of the air, and the monthly mean barometer:

| STATIONS. | MILES. | MAX. | MEAN. | HUM. | BAR. |
|---|---|---|---|---|---|
| Crete | 5935 | 25 | 8.2 | ........... | 29.97 |
| Lincoln | ........ | ........ | ........ | ........... | ........ |
| North Platte | 6342 | 80 | 8.8 | 69 | 29.96 |
| Omaha | 4990 | 40 | 6.9 | 64 | 29.98 |
| Valentine | 7313 | 60 | 10.2 | 66 | 29.91 |
| Yankton, Dakota | 5220 | 52 | 7.2 | 64 | 29.93 |

### COMPARISON OF PAST JUNES.

The table shows the mean temperature, the number of days above 85 degrees, for the past twelve Junes in southeastern Nebraska; they are found by averaging the number reported at the different stations. It also shows the highest temperature and the lowest recorded anywhere in the state by standard self-registering thermometers:

| JUNE. | MEAN TEMP. | ABOVE 85° | HIGHEST TEMP. | LOWEST TEMP. |
|---|---|---|---|---|
| 1878 | 66.7 | 8.5 | ............... | ............... |
| 1879 | 69.9 | 11.4 | 92.0 | 49.0 |
| 1880 | 73.4 | 11.6 | 97.0 | 46.0 |
| 1881 | 74.1 | 12.4 | 90.0 | 58.0 |
| 1882 | 72.2 | 11.4 | 93.0 | 46.0 |
| 1883 | 69.9 | 3.6 | 96.0 | 42.0 |
| 1884 | 71.9 | 14.2 | 94.0 | 45.0 |
| 1885 | 65.8 | 9.0 | 94.0 | 43.0 |
| 1886 | 70.0 | 8.7 | 92.0 | 33.0 |
| 1887 | 72.6 | 10.3 | 94.0 | 39.0 |
| 1888 | 69.4 | 8.0 | 102.0 | 37.0 |
| 1889 | 69.0 | 8.7 | 104.0 | 37.0 |

The following table shows the precipitation, or depth in inches, of rain and melted snow or hail, the number of cloudy days and of clear days. Days are counted cloudy when the sky is four-fifths overcast:

| JUNE. | PRECIPITATION. | DAYS OF PRECIP. | CLOUDY DAYS. | CLEAR DAYS. |
|---|---|---|---|---|
| 1878 | 5.98 | 8.2 | 4.0 | 12.7 |
| 1879 | 4.94 | 8.2 | 3.1 | 14.1 |
| 1880 | 5.27 | 7.1 | 3.6 | 12.9 |
| 1881 | 5.18 | 8.1 | 1.6 | 12.3 |
| 1882 | 5.24 | 10.5 | 5.8 | 8.6 |
| 1883 | 9.44 | 11.2 | 3.7 | 13.0 |
| 1884 | 2.48 | 5.9 | 2.7 | 11.3 |
| 1885 | 2.77 | 8.0 | 4.2 | 13.4 |
| 1886 | 4.22 | 8.9 | 1.9 | 15.0 |
| 1887 | 4.24 | 8.6 | 8.3 | 8.0 |
| 1888 | 4.32 | 7.8 | 4.0 | 7.3 |
| 1889 | 3.78 | 9.5 | 6.1 | 12.6 |

## WEATHER SIGNALS.

The daily temperature and weather predictions of the chief signal officer have been distributed by this service to the following stations, where flags have been displayed for the benefit of the public.

The following are the percentages of correct predictions, both as to temperature and weather:

| STATIONS. | DISPLAYMEN. | WEATHER. | TEMP. |
|---|---|---|---|
| Arapahoe | J. W. Tomblin | 100.0 | 96.0 |
| Beatrice | F. H. Schmidt | 86.7 | 100.0 |
| Blair | J. H. Stewart & Co | ........ | ........ |
| Chester | Stephen Forsdick | 83.3 | 91.7 |
| Coleridge | F. L. Hicks | 83.3 | 96.0 |
| Craig | E. F. Irwin | 76.0 | 96.0 |
| David City | E. B. Taylor | 73.3 | 96.7 |
| Dwight | George Ormsby | ........ | ........ |
| Fairfield | J. C. Hodge | ........ | ........ |
| Falls City | A. B. Newkirk | 73.9 | 58.3 |
| Franklin | W. A. Harshbarger | ........ | ........ |
| Fremont | A. Truesdale | 88.0 | 96.0 |
| Gibbon | C. M. Brooke | ........ | ........ |
| Gothenburg | L. G. Hutton | ........ | ........ |
| Grand Island | C. S. Howell | ........ | ........ |
| Hartington | U. K. Loose | 84.0 | 92.0 |
| Holdrege | J. D. Cogswell | 84.0 | 100.0 |
| Juniata | S. L. Brass | 84.0 | 100.0 |
| Lexington | Soren Jensen | ........ | ........ |
| Louisville | Thomas Shryock | 86.4 | 95.5 |
| Merna | M. Casteel | ........ | ........ |
| Nebraska City | J. B. Parmelee | ........ | ........ |
| Niobrara | A. B. Yantis | ........ | ........ |
| Oakdale | The Sentinel | 76.0 | 84.0 |
| Osceola | E. A. Wahatl | 79.2 | 86.2 |
| Paxton | R. D. Harris | ........ | ........ |
| Plattsmouth | J. N. Wise | 95.8 | 95.8 |
| Stromsburg | G. S. Osborn | 87.1 | 90.0 |
| Superior | G. J. Spoky | ........ | ........ |
| Syracuse | A. L. Alexander | 92.0 | 92.0 |
| Tobias | S. Larson | 75.0 | 84.0 |
| Western | J. R. Campbell | 83.3 | 79.2 |
| West Point | E. Briggs | 80.0 | 96.0 |

This gives as the percentage of correct predictions of the state:

| | |
|---|---|
| Temperature | 91.3 |
| Weather | 83.6 |
| Mean | 87.4 |

## MONTHLY MISCELLANEOUS DATA.

| STATIONS. | OBSERVERS. | TEMPERATURE OF THE AIR IN DEGREE FAHRENHEIT. | | | | | *Precipitation in inches.* | | *Number of rainy days .01 inch or more* | *Number of cloudy days* | *Number of fair days* | *Number of clear days* | *Prevailing direction of the wind* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Monthly mean from —* | | | *Maximum* | *Minimum* | Monthly, including melted snow | Total monthly snowfall | | | | | |
| | | Tri-daily observations | Noon observations | Max. and Min. | | | | | | | | | |
| SOUTHEAST SECTION. | | | | | | | | | | | | | |
| Ashland | Geo. Shedd | 69.9 | ...... | ...... | 95 | 43 | 5.63 | ...... | 8 | 4 | 8 | 18 | SE |
| Brownville | G. D. Carrington | 71.0 | ...... | ...... | 90 | 46 | 4.20 | ...... | 11 | 10 | 4 | 16 | S |
| *Crete, *a.* | G. I. Gilbert | 68.8 | ...... | 68.4 | 91 | 43 | 2.78 | ...... | 11 | 6 | 13 | 10 | SE |
| *Crete, *b.* | Observer S. S. | ...... | ...... | 68.4 | 91 | 43 | 2.78 | ...... | 11 | 4 | 17 | 9 | E |
| David City | E. B. Taylor | 62.5 | ...... | ...... | 86 | 52 | 2.65 | ...... | 11 | ...... | ...... | ...... | NW |
| Fairbury | Dr. Humphrey | ...... | ...... | ...... | 90 | ... | 0.61 | ...... | 8 | ...... | ...... | ...... | ...... |
| *Falls City | A. B. Newkirk | 69.3 | ...... | 70.8 | 94 | 48 | 3.92 | ...... | 7 | 8 | 9 | 13 | S |
| *Lincoln | F. F. Almy | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Marquette, *a* | John Ellis | ...... | 78.7 | ...... | 94 | 52 | 3.65 | ...... | 7 | ...... | ...... | ...... | ...... |
| Marquette, *b.* | J. Pinkerton | ...... | 79.0 | ...... | 92 | 55 | 3.65 | ...... | 7 | ...... | ...... | ...... | ...... |
| Minden | Joel Hull | 70.2 | ...... | ...... | 94 | 54 | 5.71 | ...... | 10 | 10 | 9 | 11 | S |
| Nebraska City | J. B. Parmelee | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Syracuse | P. W. Risser | 71.1 | ...... | 71.6 | 89 | 55 | 3.34 | ...... | 9 | ...... | ...... | ...... | ...... |
| Tecumseh | W. L. Dunlap | ...... | ...... | 70.3 | 90 | 52 | 3.85 | ...... | 9 | 3 | 14 | 13 | S |
| Weeping Water | Geo. Treat | 67.5 | ...... | ...... | 93 | 44 | 3.65 | ...... | 13 | 4 | 15 | 11 | SE |
| Weston | J. R. Campbell | 70.6 | ...... | ...... | 94 | 49 | 5.36 | ...... | 11 | ...... | ...... | ...... | S |
| Mean for section | | 69.0 | ...... | 70.3 | ...... | ... | 3.78 | ...... | 9.5 | 6.1 | 11.1 | 12.6 | ...... |
| NORTHEAST SECTION. | | | | | | | | | | | | | |
| Craig | E. F. Irwin | 69.2 | ...... | ...... | 93 | 56 | 8.75 | ...... | 10 | 9 | 5 | 16 | S |
| Creighton | Dr. Geo. Roberts | 67.3 | ...... | 68.9 | 98 | 42 | 3.53 | ...... | 10 | ...... | ...... | ...... | NW |
| De Soto | Chas. Seltz | 68.8 | ...... | ...... | 92 | 49 | 6.37 | ...... | 10 | ...... | ...... | ...... | SE |
| Fremont | I. E. Heaton | 70.2 | ...... | 69.4 | 90 | 50 | 5.18 | ...... | 7 | ...... | ...... | ...... | ...... |
| Oakdale | G. S. Clingman | 68.1 | ...... | 67.7 | 96 | 40 | 4.90 | ...... | 10 | 9 | 12 | 9 | S |
| *Omaha | Observer S. S. | 68.7 | ...... | 69.5 | 90 | 44 | 5.44 | ...... | 8 | 5 | 12 | 13 | S |
| Ponca | A. N. Porter | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Stuart | C. E. Barber | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| West Point | ‡E. G. Bruner | 68.0 | 78.2 | ...... | 90 | ... | 9.55 | ...... | 11 | ...... | ...... | ...... | S |
| *Yankton Dakota | Observer S. S. | ...... | ...... | ...... | 93 | 44 | 2.68 | ...... | 9 | 5 | 19 | 6 | S |
| Mean for section | | 68.3 | ...... | 68.9 | ...... | ... | 5.80 | ...... | 9.4 | 7.0 | 12.0 | 11.0 | ...... |
| Mean for East Neb | | 68.6 | ...... | 69.6 | ...... | ... | 4.79 | ...... | 9.4 | 6.6 | 11.6 | 11.8 | ...... |
| LOWER LOUP. | | | | | | | | | | | | | |
| Genoa | G. S. Truman | 69.6 | ...... | 69.2 | 93 | 45 | 3.22 | ...... | 9 | 12 | 7 | 11 | SE |
| North Loup | E. W. Black | 69.6 | ...... | ...... | 98 | 40 | 3.22 | ...... | 12 | ...... | ...... | ...... | ...... |
| Palmer | C. Shieldstream | 66.4 | ...... | ...... | 92 | 48 | 3.65 | ...... | 8 | ...... | ...... | ...... | S |
| Ravenna | E. Smith | ...... | 77.5 | ...... | 90 | 41 | 4.02 | ...... | 12 | 5 | 12 | 13 | N |
| West Hill | J. L. Truman | 70.5 | ...... | ...... | 92 | 55 | 1.49 | ...... | 10 | 12 | 7 | 11 | SW |
| UPPER LOUP. | | | | | | | | | | | | | |
| Alliance | T. D. Shurtz | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Ansley | Peter Fowlie | 68.1 | ...... | 70.0 | 104 | 43 | 2.93 | ...... | ...... | ...... | ...... | ...... | N |
| Bingham | W. C. Wood | ...... | ...... | ...... | ...... | ... | 37.1 | ...... | 10 | ...... | ...... | ...... | ...... |
| Sargent | J. S. Spooner | ...... | ...... | ...... | ...... | ... | ...... | ...... | 6 | ...... | ...... | ...... | ...... |
| Mean for Loup section, | | 68.8 | ...... | 69.6 | ...... | ... | 3.18 | ...... | 9.6 | 9.7 | 8.7 | 11.7 | ...... |
| NIOBRARA. | | | | | | | | | | | | | |
| Fort Robinson | Hospital Steward, | ...... | ...... | 64.6 | 96 | 38 | 2.71 | ...... | 16 | ...... | ...... | ...... | ...... |
| Kennedy | Mrs. Erickson | 67.3 | ...... | ...... | 100 | 42 | 3.06 | ...... | 6 | 5 | 11 | 14 | NW |
| *Hay Springs | Wm. Waterman | 64.1 | ...... | 63.5 | 93 | 39 | 3.41 | ...... | 6 | ...... | ...... | ...... | S |
| *Valentine | Observer S. S. | 66.0 | ...... | 65.6 | 92 | 43 | 2.99 | ...... | 10 | 6 | 8 | 16 | N |
| REPUBLICAN. | | | | | | | | | | | | | |
| ‡Culbertson | Mrs. Wibley | 70.9 | ...... | 71.6 | 101 | 49 | 2.14 | ...... | 10 | 9 | 14 | 7 | S |
| Franklin | W.A. Harshbarger | 69.1 | ...... | 69.8 | 93 | 45 | 3.62 | ...... | 6 | ...... | ...... | ...... | S |
| Red Willow | Mrs. R. Buck | ...... | ...... | ...... | ...... | ... | 4.52 | ...... | 10 | ...... | ...... | ...... | ...... |
| UPPER PLATTE. | | | | | | | | | | | | | |
| Gering | J. P. Finley | ...... | ...... | ...... | ...... | † | 1.16 | ...... | ...... | ...... | ...... | ...... | ...... |
| *Kimball | D. Henderson | 66.0 | ...... | 65.5 | 99 | 37 | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Lexington | Geo. T. Cain | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| *North Platte | Observer S. S. | 66.0 | ...... | 66.6 | 91 | 42 | 1.95 | ...... | 14 | 8 | 17 | 5 | SE |
| Sidney | Oberfelder & Co. | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Mean for West Neb | | 67.1 | ...... | 66.7 | ...... | ... | 3.05 | ...... | 9.8 | 7.0 | 12.5 | 10.5 | ...... |
| Mean for state | | 68.3 | ...... | 68.9 | ...... | ... | 3.95 | ...... | 9.6 | 7.4 | 11.1 | 11.4 | S |

*** Maximum and minimum temperature from self-registering thermometer. T in precipitation column indicates trace. † For 22 days.**

## JULY.

The month of July has been, both in temperature and rainfall, a month of extremes: the temperature has never risen so high, nor fallen so low, nor has there been so large a rainfall in July, since the organization of the service; the maximum temperature has not been exceeded in any month and the rainfall only in the month of June, 1883.

### TEMPERATURE.

The mean temperature has been two degrees below the normal, but there passed over the state on the sixth and seventh of the month a hot wave, bringing the highest temperatures on record, reaching one hundred and eleven degrees at Mullen, and nearly as high throughout the western part of the state generally, but diminishing as the wave moved eastward, giving temperatures of from ninety-two to a hundred in the eastern part of the state.

The minimum for the month was thirty-eight degrees at Kimball, which is exceedingly low for July.

### PRECIPITATION.

Excepting in the western portion of the state the rainfall has been excessive. The normal rainfall for July is four and four-tenths inches; the past month it has ranged from 1.29 inches at Bingham to 13.20 inches at Minden; the whole central portion of the state has been deluged with rain, rendering harvesting difficult, and spoiling considerable grain.

### NOTES FROM OBSERVERS.

"The continuous rain from the 8th to the 23d caused quite a delay in harvesting and haying, and damaged the small grain to a considerable extent, so that the most of it will hardly pass for No. 3."—P. W. RISSER, Syracuse.

"Wet harvest weather, but the grain is secured in fair condition. Very favorable month for corn."—G. TREAT, Weeping Water.

"Too much wet weather for small grains; damage considerable. Extraordinary corn crop almost assured. Grub worms seriously injuring potatoes."—W. L. DUNLAP, Tecumseh.

"The month has been cooler than the average, though crops have not been damaged thereby. Wheat in a good yield. Oats are much lighter than expected; corn a little backward, compared with last year. Damage by corn worm not as great as estimated earlier in the season."—E. F. IRWIN, Craig.

"From the 27th to the close of the month smoky atmosphere prevailed; sun blood-red."—G. D. CARRINGTON, Brownville.

"Corn prospect good; oats and flax light and partially damaged by rains. Wheat and rye acreage insignificant. Hay making not begun; grass light on the uplands."—JOHN ELLIS, Marquette.

"Dense yellow smoke in the atmosphere has interfered with photographic printing, and has also probably slightly retarded the growth of corn and other vegetables during the latter part of the month."—E. W. BLACK, North Loup.

"The rainfall for the month has been unusually heavy, damp weather detrimental to the harvesting of small grain. Thermometer on the morning of the 3d 42° and fires comfortable; vegetation at this time fresh and green as in spring. Corn in silk and in splendid condition. Month closes with pleasant weather, smoky or hazy; for four days sun showed a red ball at midday."—Mrs. L. A. Wibley, Culbertson.

"On the 25th and 26th the sky presented a greenish-yellow appearance, the sun looked blood-red and cast no shadow; this lasted through both days; there was very little wind, and the phenomena was not caused by smoke. Hay crop in this section will be very light. The hail storm of the 18th damaged crops considerably."—S. W. Reynolds, Fort Robinson.

### TABLES.

The following are the total number of miles traveled by the wind during the month, the maximum and average velocity per hour, the mean humidity of the air, and the monthly mean barometer:

| STATION. | MILES. | MAX. | MEAN. | HUM. | BAR. |
|---|---|---|---|---|---|
| Crete | 6476 | 36 | 8.7 | ........ | 29.96 |
| Lincoln | ........ | ........ | ........ | ........ | ........ |
| North Platte | 7212 | 60 | 9.7 | 70 | 29.95 |
| Omaha | 5328 | 40 | 7.2 | 73 | 29.97 |
| Sioux City, Iowa | 5696 | 60 | 7.7 | ........ | 29.91 |
| Valentine | 8230 | 58 | 11.1 | ........ | 29.82 |
| Yankton, Dakota | 5969 | 48 | 8.0 | 70 | 29.99 |

### COMPARISON OF PAST JULYS.

The table shows the mean temperature, the number of days above 85 degrees, for the past twelve Julys in southeastern Nebraska; they are found by averaging the number reported at the different stations. It also shows the highest temperature and the lowest recorded anywhere in the state by standard self-registering thermometers:

| JULY. | MEAN TEMP. | ABOVE 85°. | HIGHEST TEMP. | LOWEST TEMP. |
|---|---|---|---|---|
| 1878 | 77.4 | 15.1 | 96.0 | 52.0 |
| 1879 | 76.1 | 18.1 | 97.0 | 64.0 |
| 1880 | 75.0 | 18.9 | 97.0 | 54.0 |
| 1881 | 78.1 | 22.1 | 96.0 | 63.0 |
| 1882 | 70.6 | 8.2 | 99.0 | 52.0 |
| 1883 | 76.0 | 15.1 | 99.0 | 52.0 |
| 1884 | 74.8 | 12.6 | 97.0 | 52.0 |
| 1885 | 75.5 | 13.4 | 98.0 | 51.0 |
| 1886 | 77.4 | 24.6 | 102.0 | 55.0 |
| 1887 | 76.4 | 20.7 | 103.0 | 47.0 |
| 1888 | 78.8 | 20.0 | 105.0 | 45.0 |
| 1889 | 73.8 | 13.3 | 111.0 | 38.0 |

The following table shows the precipitation or depth in inches of rain and melted snow or hail, the number of cloudy and of clear days. Days are counted cloudy when the sky is four-fifths overcast:

| JULY. | PRECIPITATION. | DAYS OF PRECIP. | CLOUDY DAYS. | CLEAR DAYS. |
|---|---|---|---|---|
| 1878 | 6.36 | 8.0 | 1.5 | 16.7 |
| 1879 | 5.56 | 8.6 | 2.0 | 11.7 |
| 1880 | 3.83 | 6.8 | 1.0 | 18.0 |
| 1881 | 3.53 | 5.0 | 1.8 | 13.4 |
| 1882 | 3.89 | 8.2 | 3.3 | 13.6 |
| 1883 | 3.18 | 8.1 | 4.1 | 13.6 |
| 1884 | 6.94 | 11.0 | 4.4 | 11.0 |
| 1885 | 5.27 | 9.6 | 6.6 | 14.8 |
| 1886 | 1.31 | 4.5 | 3.3 | 20.5 |
| 1887 | 2.74 | 7.7 | 3.0 | 14.0 |
| 1888 | 3.06 | 7.1 | 6.0 | 10.0 |
| 1889 | 7.11 | 9.8 | 8.3 | 12.0 |

### WEATHER SIGNALS.

The daily temperature and weather predictions of the chief signal officer have been distributed by this service to the following stations, where flags have been displayed for the benefit of the public.

The following are the percentages of correct predictions, both as to temperature and weather:

| STATION. | DISPLAYMAN. | WEATHER. | TEMP. |
|---|---|---|---|
| Arapahoe | J. W. Tomblin | | |
| Beatrice | F. H. Schmidt | | |
| Blair | J. H. Stewart & Co | | |
| Chester | Stephen Forsdick | 88.5 | 73.1 |
| Coleridge | F. L. Hicks | | |
| Craig | E. F. Irwin | 73.1 | 92.3 |
| David City | E. B. Taylor | 80.8 | 80.8 |
| Dwight | Geo. Ormsby | | |
| Fairfield | J. C. Hodge | | |
| Falls City | A. B. Newkirk | 57.7 | 64.6 |
| Franklin | W. A. Harshbarger | | |
| Fremont | A. Truesdale | 82.1 | 92.8 |
| Gibbon | C. M. Brooke | | |
| Gothenburg | L. G. Hutton | | |
| Grand Island | C. S. Howell | | |
| Hartington | U. K. Loose | 81.5 | 88.9 |
| Holdrege | J. D. Cogswell | 60.0 | 72.0 |
| Juniata | S. L. Brass | 90.9 | 100.0 |
| Lexington | Soren Jensen | | |
| Louisville | Thomas Shryock | | |
| Merna | M. Casteel | 85.2 | 88.9 |
| Nebraska City | J. B. Parmelee | | |
| Niobrara | A. B. Yantis | | |
| Oakdale | The Sentinel | 77.7 | 85.2 |
| Osceola | E. A. Walrath | 71.4 | 89.7 |
| Paxton | R. D. Harris | | |
| Plattsmouth | J. N. Wise | 64.3 | 86.2 |
| Stromsburg | G. S. Osborn | | |
| Superior | G. J. Spoky | | |
| Syracuse | A. L. Alexander | | |
| Tobias | S. Larson | 66.7 | 84.0 |
| Western | J. R. Campbell | | |
| West Point | E. Briggs | 64.3 | 100.0 |

This gives as the percentage of correct predictions of the state:

| | |
|---|---|
| Temperature | 85.6 |
| Weather | 74.6 |
| Mean | 80.1 |

## MONTHLY MISCELLANEOUS DATA.

| STATIONS. | OBSERVERS. | TEMPERATURE OF THE AIR IN DEGREES FAHRENHEIT. | | | | | *Precipitation in inches.* | | *No. rainy days, .01 inch or more.* | *No. of cloudy days* | *No. of fair days* | *No. of clear days* | *Prevailing direction of the wind.* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Monthly mean from—* | | | *Maximum* | *Minimum* | Monthly, including melted snow | Total monthly snow-fall | | | | | |
| | | Tri-daily observations | Noon obersvations | Max. and Min. | | | | | | | | | |
| SOUTHEAST SECTION. | | | | | | | | | | | | | |
| Ashland | Geo. Shedd | 74.2 | ...... | ...... | 98 | 50 | 8.94 | ...... | 11 | 6 | 9 | 16 | S |
| Brownville | G. D. Carrington | 76.6 | ...... | 75.2 | 96 | 54 | 5.19 | ...... | 9 | 10 | 3 | 18 | N |
| *Crete, *a* | G. I. Gilbert | 73.1 | ...... | 74.2 | 95 | 50 | 6.05 | ...... | 11 | 10 | 14 | 7 | SE |
| *Crete, *b* | Observer, S. S. | ...... | ...... | 74.2 | 95 | 50 | 6.05 | ...... | 11 | 11 | 13 | 7 | SE |
| David City | E. B. Taylor | 66.8 | ...... | ...... | 92 | 42 | 4.98 | ...... | 8 | ...... | ...... | ...... | NE |
| Fairbury | Dr. Humphrey | ...... | ...... | ...... | 96 | ... | 8.75 | ...... | 11 | ...... | ...... | ...... | ...... |
| *Falls City | A. B. Newkirk | 74.5 | ...... | 75.6 | 97 | 53 | 5.37 | ...... | 8 | 9 | ...... | 13 | SE |
| *Lincoln | F. F. Almy | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | 9 | ...... | ...... |
| Marquette, *a* | John Ellis | ...... | 81.5 | ...... | 102 | 52 | 9.59 | ...... | 9 | ...... | ...... | ...... | ...... |
| Marquette, *b* | J. Pinkerton | ...... | 81.1 | ...... | 103 | 50 | 11.18 | ...... | 9 | ...... | ...... | ...... | ...... |
| Minden | Joel Hull | 74.8 | ...... | ...... | 98 | 58 | 13.20 | ...... | 14 | 10 | 11 | 10 | S |
| Nebraska City | J. B. Parmelee | 74.0 | ...... | ...... | 92 | 51 | 4.38 | ...... | 8 | ...... | ...... | ...... | ...... |
| Syracuse | P. W. Risser | 75.3 | ...... | 76.9 | 95 | 62 | 5.53 | ...... | 8 | ...... | ...... | ...... | ...... |
| Tecumseh | W. L. Dunlap | ...... | ...... | 75.2 | 93 | 52 | 5.40 | ...... | 9 | ...... | ...... | ...... | SE |
| Weeping Water | George Treat | 73.8 | ...... | ...... | 100 | 47 | 5.50 | ...... | 10 | 4 | 9 | 8 | SE |
| Weston | J. R. Campbell | 75.0 | ...... | ...... | 96 | 58 | 8.80 | ...... | 11 | ...... | ...... | ...... | S |
| Mean for section | ...... | 73.8 | ...... | 75.4 | ...... | ... | 7.11 | ...... | 9.8 | 8.3 | 9.0 | 12.0 | ...... |
| NORTHEAST SECTION. | | | | | | | | | | | | | |
| Craig | E. F. Irwin | 73.0 | ...... | ...... | 94 | 57 | 6.09 | ...... | 10 | 9 | 7 | 15 | S |
| Creighton | Dr. Geo. Roberts | 73.3 | ...... | 72.6 | 102 | 44 | 7.88 | ...... | 17 | ...... | ...... | ...... | S |
| De Soto | Chas. Seltz | 74.4 | ...... | ...... | 96 | 54 | 3.49 | ...... | 10 | ...... | ...... | ...... | S |
| Fremont | I. E. Heaton | 73.7 | ...... | 72.0 | 96 | 54 | 10-02 | ...... | 9 | ...... | ...... | ...... | ...... |
| Oakdale | G. S. Clingman | 71.5 | ...... | 71.9 | 99 | 45 | 4.03 | ...... | 12 | 10 | 10 | 11 | S |
| *Omaha | Observer S. S. | 74.8 | ...... | 74.8 | 94 | 56 | 4.94 | ...... | 12 | 10 | 12 | 9 | S |
| Ponca | A. N. Porter | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Sioux City, Iowa | Observer S. S. | 75.0 | ...... | ...... | 92 | 58 | 3.31 | ...... | 11 | ...... | ...... | 11 | NW |
| Stuart | C. E. Barber | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| West Point | E. G. Bruner | ...... | 78.7 | ...... | 100 | ... | 3.62 | ...... | 8 | ...... | ...... | ...... | N |
| *Yankton, Dakota | Observer S. S. | 73.2 | ...... | ...... | 98 | 50 | 4.54 | ...... | 11 | 11 | 8 | 12 | S |
| Mean for section | ...... | 73.6 | ...... | 72.8 | ...... | ... | 4.88 | ...... | 11.1 | 10 | 9.4 | 11 6 | ...... |
| Mean for East Neb | ...... | 73.7 | ...... | 74.1 | ...... | ... | 6.00 | ...... | 10.4 | 9.2 | 9.2 | 11.8 | ...... |
| LOWER LOUP. | | | | | | | | | | | | | |
| Genoa | G. S. Truman | 73.4 | ...... | 72.8 | 99 | 52 | 5.96 | ...... | 10 | 14 | 5 | 9 | SE |
| North Loup | E. W. Black | 72.1 | ...... | ...... | 100 | 42 | 10.37 | ...... | 12 | ...... | ...... | ...... | ...... |
| Palmer | C. Shieldstream | 76.0 | ...... | ...... | 100 | 60 | 9.75 | ...... | 8 | ...... | ...... | ...... | S |
| Ravenna | E. Smith | ...... | 78.5 | ...... | 98 | 43 | 8.76 | ...... | 13 | 7 | 15 | 9 | S |
| West Hill | J. L. Truman | 74.3 | ...... | ...... | 102 | 60 | 5.32 | ...... | 10 | 12 | 7 | 12 | SE |
| UPPER LOUP. | | | | | | | | | | | | | |
| Alliance | T. D. Shurtz | ...... | ...... | ...... | ...... | ... | ...... | ...... | 8 | ...... | ...... | ...... | ...... |
| Ansley | Peter Fowlie | 71.4 | ...... | 73.8 | 105 | 43 | 8.90 | ...... | 8 | ...... | ...... | ...... | N |
| Bingham | W. C. Wood | 72.4 | ...... | 70.3 | 103 | 48 | 1.29 | ...... | 9 | ...... | ...... | ...... | ...... |
| Mullen | F. L. Mary | ...... | ...... | ...... | 111 | 61 | 2.59 | ...... | 9 | ...... | ...... | ...... | SE |
| Sargent | J. S. Spooner | 75.0 | ...... | ...... | 101 | ... | 4.76 | ...... | 9 | ...... | ...... | ...... | SE |
| Mean for Loup section | ...... | 73.5 | ...... | 72.3 | ...... | ... | 6.41 | ...... | 9.7 | 11.0 | 9.0 | 10.0 | ...... |
| NIOBRARA. | | | | | | | | | | | | | |
| Fort Robinson | Hospital Steward | ...... | ...... | 71.0 | 106 | 40 | 2.67 | ...... | 12 | ...... | ...... | ...... | NW |
| Kennedy | Mrs. Erickson | 72.0 | ...... | ...... | 105 | 52 | 2.02 | ...... | 9 | 8 | 11 | 12 | SE |
| *Hay Springs | Wm. Waterman | 70.2 | ...... | 70.4 | 104 | 44 | 1.86 | ...... | 6 | 4 | 14 | 13 | NW |
| *Valentine | Observer S. S. | 71.6 | ...... | 71.6 | 106 | 44 | 2 60 | ...... | 8 | 10 | 7 | 14 | S |
| REPUBLICAN. | | | | | | | | | | | | | |
| Culbertson | Mrs. Wibley | 79.2 | ...... | 79.0 | 108 | 42 | 6.62 | ...... | 8 | 8 | 9 | 14 | S |
| Franklin | W. A. Harshbarger, | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Red Willow | Mrs. R. Buck | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Superior | E. H. Kern | 77.0 | ...... | ...... | 96 | 58 | 10 25 | ...... | 7 | ...... | ...... | ...... | ...... |
| Stratton | J. B. Slinn | ...... | ...... | 75.5 | 98 | 48 | 1.95 | ...... | 5 | ...... | ...... | ...... | ...... |
| UPPER PLATTE. | | | | | | | | | | | | | |
| Gering | J. P. Finley | 74.4 | ...... | ...... | 101 | 54 | 2.14 | ...... | 4 | ...... | ...... | ...... | SE |
| *Kimball | D. Henderson | ...... | ...... | 71.5 | 108 | 38 | 1.62 | ...... | 8 | ...... | ...... | ...... | ...... |
| Lexington | Geo. T. Cain | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| *North Platte | Observer S. S. | 72.0 | ...... | 72.0 | 102 | 42 | 6.01 | ...... | 10 | 8 | 14 | 9 | SE |
| Sidney | Oberfelder & Co. | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Mean for West Neb | ...... | 73.8 | ...... | 72.0 | ...... | ... | 3.77 | ...... | 7.7 | 7.6 | 11.0 | 12.4 | ...... |
| Mean for State | ...... | 73.7 | ...... | 72.9 | ...... | ... | 5.54 | ...... | 9.6 | 9.2 | 9.6 | 11.5 | S |

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* Maximum and minimum temperature from self-registering thermometer. T in precipitation column indicates trace.

## AUGUST.

The month of August has been rather cool and cloudy, with a fair amount of rainfall over the state generally, and a very heavy precipitation in the extreme southeast.

### TEMPERATURE.

The mean temperature for the month in southeastern Nebraska was 72.°8, which is about a degree below the normal; the hottest day was at Kimball, where 105° was registered, and the coolest was 40° at Fort Robinson. This maximum is an unusual one for August, but the minimum in 1888 was 34° and in 1887 was 38°.

### PRECIPITATION.

The greater part of the state has had between one and two inches of rain; the extreme northwest over three, and the region from the Blue river to the Missouri generally over six, reaching a maximum of 12.10 inches at Tecumseh. The number of rainy days, however, was below the normal in the southeastern part of the state and indeed over the state generally, the rainfall occuring mostly in one heavy rain throughout the southeast.

The month has been favorable for crops generally, although corn would have grown faster with warmer weather. It is uncommon to see the verdure looking so fresh in Nebraska at the beginning of September.

### NOTES FROM OBSERVERS.

"The month is noted for its uniformity of mean daily temperature, excellent corn weather."—G. TREAT, Weeping Water.

"The month has given an unusual amount of clear days, being beneficial to the maturing of corn. The latter part of the month has been the best haying weather for several seasons."—E. F. IRWIN, Craig.

"The month has been very dry, and the drouth has injured part of the corn crop. The mean temperature for the month is one-half a degree above that for July, while generally July has the highest mean."—G. S. CLINGMAN, Oakdale.

"The rain storm of the 12th was the heaviest I ever witnessed. The train near Table Rock had to stop to avoid being blown from the track; could not see beyond one hundred feet; such was the down-pour that in less than thirty minutes the small bridges were afloat. The lightning poured down in cherry-red streams and appeared to splash up three or four feet, somewhat like melted iron when poured from a height on the ground."—W. L. DUNLAP, Tecumseh.

"August has been all we can desire for perfecting an unusually heavy crop of corn, with rain enough for a heavy grass crop. Early planted corn safe from frost; fruit abundant; in short, this section loaded with every crop."—DR. HUMPHREY, Fairbury.

"Corn is not yet out of danger from frost. The threshed grain yields small. Rain needed for plowing."—C. SHIELDSTREAM, Palmer.

"The continuous dry wind from the south, especially for the past ten days of the month, is beginning to show its effects in the parching of vegetation."—G. S. TRUMAN, Genoa.

"The unusually hazy weather in July and August is perhaps cause for slightly lower temperature and also the large number of dew-falls. Corn is very rapidly maturing and will be out of the way of frost in ten days. Abundance of precipitation has produced a large growth, and the prospect is a larger crop than for years. All small grain a full average except oats. Hogs and cattle doing well, no disease. Considerable fall plowing being done."—JOEL HULL, Minden.

"Crops and especially grass are beginning to suffer from drouth."—S. W. REYNOLDS, Fort Robinson.

### TABLES.

The following are the total number of miles traveled by the wind during the month, the maximum and average velocity per hour, the mean humidity of the air and the monthly mean barometer:

| STATION. | MILES. | MAX. | MEAN. | HUM. | BAR. |
|---|---|---|---|---|---|
| Crete | 5105 | ...... | 7.1 | ...... | 29.96 |
| Lincoln | ...... | ...... | ...... | ...... | ...... |
| North Platte | 7141 | 48 | 9.6 | 69 | 29.99 |
| Omaha | 5201 | 32 | 7.0 | 73 | 30.04 |
| Sioux City, Iowa | 7401 | 60 | 9.9 | ...... | 29.98 |
| Valentine | 7867 | 60 | 10.6 | 60 | 29.92 |
| Yankton, Dakota | 5567 | 36 | 7.5 | 69 | 29.98 |

### COMPARISON OF PAST AUGUSTS.

The table shows the mean temperature, the number of rainy days above eighty-five degrees, for the past twelve Augusts in southeastern Nebraska; they are found by averaging the number reported at the different stations. It also shows the highest temperature and the lowest recorded anywhere in the state by standard self-registering thermometers:

| AUGUST. | MEAN TEMP. | ABOVE 85° | HIGHEST TEMP. | LOWEST TEMP. |
|---|---|---|---|---|
| 1878 | 75.7 | ...... | 97.0 | 51.0 |
| 1879 | 74.4 | ...... | 95.0 | 55.0 |
| 1880 | 75.0 | ...... | 97.0 | 51.0 |
| 1881 | 79.5 | 25.0 | 100.0 | 63.0 |
| 1882 | 73.0 | 18.4 | 91.0 | 52.0 |
| 1883 | 74.1 | 9.6 | 92.0 | 47.0 |
| 1884 | 70.2 | 3.0 | 93.0 | 46.0 |
| 1885 | 69.9 | 9.2 | 91.0 | 47.0 |
| 1886 | 75.8 | 19.7 | 98.8 | 40.0 |
| 1887 | 70.9 | 13.5 | 102.0 | 38.0 |
| 1888 | 72.1 | 8.6 | 103.0 | 34.0 |
| 1889 | 72.8 | 12.5 | 105.0 | 40.0 |

The following table shows the precipitation, or depth in inches, of rain and melted snow or hail, the number of cloudy and of clear days. Days are counted cloudy when the sky is four-fifths overcast:

| AUGUST. | PRECIPITATION. | DAYS OF PRECIP. | CLOUDY DAYS. | CLEAR DAYS. |
|---|---|---|---|---|
| 1878 | 3.14 | 4.0 | 0.7 | 21.0 |
| 1879 | 2.09 | 5.0 | 1.9 | 18.4 |
| 1880 | 4.86 | 7.1 | 4.8 | 17.0 |
| 1881 | 1.59 | 3.7 | 3.2 | 17.4 |
| 1882 | 1.58 | 4.0 | 1.9 | 18.6 |
| 1883 | 3.58 | 7.6 | 4.4 | 13.6 |
| 1884 | 3.76 | 7.1 | 7.0 | 13.7 |
| 1885 | 3.96 | 7.9 | 4.8 | 13.8 |
| 1886 | 2.97 | 7.0 | 3.7 | 15.0 |
| 1887 | 3.99 | 9.8 | 9.0 | 10.0 |
| 1888 | 3.64 | 8.8 | 8.6 | 11.5 |
| 1889 | 5.81 | 5.9 | 6.8 | 15.9 |

## WEATHER SIGNALS.

The daily temperature and weather predictions of the chief signal officer have been distributed by this service to the following stations, where flags have been displayed for the benefit of the public.

The following are the percentages of correct predictions, both as to temperature and weather:

| STATION. | DISPLAYMAN. | WEATHER. | TEMP. |
|---|---|---|---|
| Beatrice | F. H. Schmidt | 88.9 | 100.0 |
| Chester | Stephen Forsdick | 92.6 | 88.9 |
| Craig | E. F. Irwin | 88.9 | 88.9 |
| David City | E. B. Taylor | 92.6 | 100.0 |
| Falls City | A. B. Newkirk | 85.2 | 51.9 |
| Hartington | U. K. Loose | 92.6 | 96.3 |
| Hebron | M. S. Phillips | 100.0 | 100.0 |
| Holdrege | J. D. Cogswell | 81.5 | 77.8 |
| Juniata | S. L. Brass | 88.9 | 92.6 |
| Merna | M. Casteel | 88.9 | 81.5 |
| Nebraska City | J. B. Parmelee | ........ | ........ |
| Oakdale | The Sentinel | 81.5 | 92.6 |
| Plattsmouth | J. N. Wise | 92.6 | 92.6 |
| Tobias | S. Larson | 85.2 | 100.0 |
| West Point | E. Briggs | 81.5 | 96.3 |

This gives as the percentage of correct predictions of the state:

| | |
|---|---|
| Temperature | 88.6 |
| Weather | 90.0 |
| Mean | 89.3 |

## MONTHLY MISCELLANEOUS DATA.

| STATIONS. | OBSERVERS. | TEMPERATURE OF THE AIR IN DEGREES FAHRENHEIT. | | | | | Precipitation in inches. | | No. rainy days, .01 inch or more. | No. of cloudy days. | No. of fair days. | No. of clear days. | Prevailing direction of the wind. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Monthly mean from— | | | Maximum. | Minimum. | Monthly, including melted snow. | Total monthly snow fall. | | | | | |
| | | Tri-daily observations. | Noon observations. | Max. and Min. | | | | | | | | | |
| SOUTHEAST SECTION. | | | | | | | | | | | | | |
| Ashland | Geo. Shedd | 70.3 | ...... | ...... | 93 | 54 | 8.46 | ...... | 7 | 3 | 6 | 22 | S |
| Brownville | G. D. Carrington | 74.5 | 82.3 | ...... | 94 | 52 | 6.07 | ...... | 6 | 8 | 4 | 19 | S |
| *Crete, *a* | G. I. Gilbert | 72.0 | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| *Crete, *b* | Observer S. S. | ...... | ...... | 72.4 | 89 | 51 | 5.86 | ...... | 6 | 9 | 6 | 10 | SE |
| David City | E. B. Taylor | 65.5 | ...... | ...... | 88 | 52 | 1.70 | ...... | 2 | ...... | ...... | ...... | S |
| Fairbury | Dr. Humphrey | ...... | ...... | ...... | ...... | ... | 1.01 | ...... | 7 | ...... | ...... | ...... | SE |
| *Falls City | A. B. Newkirk | 72.3 | ...... | 74.0 | 93 | 54 | 5.01 | ...... | 6 | 7 | 13 | 11 | SE |
| *Lincoln | F. F. Almy | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Marquette, *a* | John Ellis | ...... | 81.9 | ...... | 97 | 55 | 3.53 | ...... | 4 | ...... | ...... | ...... | ...... |
| Marquette, *b* | J. Pinkerton | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Minden | Joel Hull | 73.8 | ...... | ...... | 96 | 54 | 2.40 | ...... | 9 | 10 | 12 | 9 | S |
| Nebraska City | J. B. Parmelee | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Syracuse | P. W. Risser | 72.9 | ...... | ...... | 90 | 59 | 3.84 | ...... | 5 | ...... | ...... | ...... | ...... |
| Tecumseh | W. L. Dunlap | 75.8 | ...... | ...... | 89 | 61 | 12.10 | ...... | 7 | 9 | 5 | 17 | S |
| Weeping Water | Garry Treat | 74.4 | ...... | ...... | 94 | 51 | 8.11 | ...... | 5 | 1 | 10 | 9 | SE |
| Weston | J. R. Campbell | 76.0 | ...... | ...... | 95 | 54 | 11.58 | ...... | 7 | 7 | 0 | 24 | S |
| Mean for section | | 72.8 | ...... | ...... | ...... | ... | 5.81 | ...... | 5.9 | 6.8 | 7.0 | 15.9 | ...... |
| NORTHEAST SECTION. | | | | | | | | | | | | | |
| Craig | E. F. Irwin | 72.0 | ...... | ...... | 89 | 58 | 2.43 | ...... | 6 | 4 | 4 | 23 | S |
| Creighton | Dr. Geo. Roberts | 68.5 | ...... | 72.5 | 97 | 45 | 0.35 | ...... | 3 | 11 | 0 | 20 | S |
| De Soto | Chas Seltz | 72.4 | ...... | ...... | 93 | 54 | 1.42 | ...... | 8 | 4 | 10 | 17 | SE |
| Fremont | I. E. Heaton | 73.2 | ...... | 73.1 | 91 | 56 | 2.02 | ...... | 6 | ...... | ...... | ...... | ...... |
| Oakdale | G. S. Clingman | 71.4 | ...... | 72.8 | 96 | 50 | 0.30 | ...... | 7 | 5 | 20 | 6 | S |
| *Omaha | Observer S. S. | 74.0 | ...... | 74.0 | 92 | 56 | 2.90 | ...... | 7 | 5 | 12 | 14 | S |
| Ponca | A. N. Porter | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Sioux City Iowa | Observer S. S. | 73.0 | ...... | ...... | 92 | 55 | 1.19 | ...... | 8 | 7 | 8 | 16 | SE |
| Stuart | C. E. Barber | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| West Point | E. G. Bruner | ...... | 82.2 | ...... | 92 | ... | 3.00 | ...... | 2 | ...... | ...... | ...... | S |
| *Yankton, Dakota | Observer S. S. | 73.4 | ...... | ...... | 96 | 51 | 2.68 | ...... | 5 | 6 | 13 | 12 | S |
| Mean for section | | 72.2 | ...... | ...... | ...... | ... | 1.82 | ...... | 5.8 | 6.3 | 9.5 | 15.1 | ...... |
| Mean for East Neb | | 72.5 | ...... | ...... | ...... | ... | 3.82 | ...... | 5.8 | 6.6 | 8.2 | 15.5 | ...... |
| LOWER LOUP. | | | | | | | | | | | | | |
| Genoa | G. S. Truman | 72.8 | ...... | 73.1 | 91 | 53 | 1.24 | ...... | 7 | 9 | 16 | 6 | SE |
| North Loup | E. W. Black | 70.5 | ...... | ...... | 95 | 46 | 1.58 | ...... | 7 | ...... | ...... | ...... | ...... |
| Palmer | C. Shieldstream | 68.5 | ...... | ...... | 92 | 52 | 2.30 | ...... | 2 | ...... | ...... | ...... | S |
| *Ravenna | E. Smith | ...... | 79.2 | ...... | 93 | 47 | 1.79 | ...... | 7 | 4 | 15 | 12 | S |
| West Hill | J. L. Truman | 74.1 | ...... | ...... | 92 | 56 | 1.31 | ...... | 5 | 5 | 7 | 19 | S |
| UPPER LOUP. | | | | | | | | | | | | | |
| Alliance | T. D. Shurtz | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Ansley | Peter Fowlie | ...... | ...... | ...... | ...... | ... | 1.78 | ...... | ...... | ...... | ...... | ...... | ...... |
| Bingham | W. C. Wood | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Mullen | F. L. Mary | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Sargent | J. S. Spooner | 74.5 | ...... | ...... | 100 | 57 | 1.28 | ...... | 4 | ...... | ...... | ...... | SE |
| Mean for Loup section, | | 72.0 | ...... | ...... | ...... | ... | 1.61 | ...... | 5.3 | 6.0 | 13 | 12 | ...... |
| NIOBRARA. | | | | | | | | | | | | | |
| Fort Robinson | Hospital Steward | ...... | ...... | 70.8 | 99 | 40 | 2.25 | ...... | 8 | ...... | ...... | ...... | ...... |
| Kennedy | Mrs. Erickson | 72.8 | ...... | ...... | 103 | 50 | 1.28 | ...... | 9 | 3 | 11 | 17 | SE |
| *Hay Springs | Wm. Waterman | 70.3 | ...... | ...... | 98 | 43 | 3.55 | ...... | 6 | 4 | 9 | 18 | SW |
| *Valentine | Observer S. S. | 73.0 | ...... | 73.0 | 98 | 46 | 0.34 | ...... | 6 | 3 | 10 | 18 | S |
| REPUBLICAN. | | | | | | | | | | | | | |
| Culbertson | Mrs. Wibley | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Franklin | W. A. Harshbarger, | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Red Willow | Mrs. R. Buck | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Superior | E. H. Kern | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Stratton | J. B. Slinn | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| UPPER PLATTE. | | | | | | | | | | | | | |
| Gering | J. P. Finley | 74.0 | ...... | 73.2 | 102 | 48 | 1.27 | ...... | 6 | ...... | ...... | ...... | ...... |
| *Kimball | D. Henderson | 70.0 | ...... | 72.0 | 105 | 41 | 1.97 | ...... | 6 | ...... | ...... | ...... | SE |
| Lexington | Geo. T. Cain | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| *North Platte | Observer S. S. | 72.0 | ...... | 72.0 | 96 | 47 | 2.06 | ...... | 10 | 3 | 18 | 10 | N |
| Sidney | Oberfelder & Co. | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Mean for West Neb | | 72.2 | ...... | ...... | ...... | ... | 1.82 | ...... | 7.3 | 3.3 | 1.2 | 12.6 | ...... |
| Mean for State | | 72.3 | ...... | ...... | ...... | ... | 2.76 | ...... | 6.1 | 5.6 | 10.4 | 14.7 | S |

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* Maximum and minimum temperature from self-registering thermometer. T in precipitation column indicates trace.

## SEPTEMBER.

The month of September has been a cool, dry month, with less than the normal number of rainy days.

### TEMPERATURE.

The mean temperature for southeastern Nebraska was 61.6°, which is about three degrees below the normal; the month, however, was one of extremes, several days reaching 100°, which is unusual for the month of September, while the minimum for the month, 24°, is also considerably lower than usual. Slight frost occurred on several days, but the first killing frost did not occur till near the end of the month, except in the northwestern portion of the state, where it occurred on the sixth. These are about the average dates for the first killing frost.

### PRECIPITATION.

The rainfall for the month has varied from a small fraction of an inch in the western portions of the state to over three inches in parts of the eastern portions, reaching a maximum of 3.70 inches at Creighton. The number of cloudy days was about nine, or nearly double the usual number.

### NOTES FROM OBSERVERS.

"Not enough rain to make ground in good condition for fall work. Corn is largest crop for several seasons."—E. F. IRWIN, Craig.

"Growing weather is practically ended, excepting for tame grass and some fall grain. Corn gathering is begun by some farmers. Apples very plenty."—G. TREAT, Weeping Water.

"The first frost of the season was a light one on the 15th; two more frosts occurred after the 15th, a heavy one on the 18th, and a light one on the 27th. Corn turned out better than it was expected it would the last of August."—G. S. CLINGMAN, Oakdale.

"There has been no frost at this station, so far, to kill vegetation, though slight frosts were reported from low places. All crops are now safe for the season, and though we have had seasonable showers the ground is quite dry."—G. S. TRUMAN, Genoa.

"But little rain has fallen this month. Some fields of corn badly injured by hot winds in August, but corn as a whole is an enormous crop; wheat is good and is being marketed rapidly; potatoes for the most part small, but yield well; frost has been frequent, but not heavy."—Mrs. L. A. WIBLEY, Culbertson.

"Frost on the 2d killed melon vines, etc., and on the 5th and 6th killed corn and formed ice."—W. WATERMAN, Hay Springs.

"Very dry, and crops suffering."—S. W. REYNOLDS, Fort Robinson.

### TABLES.

The following are the total number of miles traveled by the wind during the month, the maximum and average velocity per hour, the mean humidity of the air, and the monthly mean barometer.

| STATION. | MILES. | MAX. | MEAN. | HUM. | BAR. |
|---|---|---|---|---|---|
| Crete | ........ | ........ | ........ | ........ | ........ |
| Lincoln | ........ | ........ | ........ | ........ | ........ |
| North Platte | 7104 | 40 | 9.9 | 64 | 30.02 |
| Omaha | 5393 | 33 | 7.5 | 73 | 30.03 |
| Sioux City | 7198 | 40 | 10.0 | ........ | 29.98 |
| Valentine | 8488 | 60 | 11.8 | 67 | 29.98 |
| Yankton, Dakota | 5842 | 27 | 8.1 | ........ | 29.98 |

### COMPARISON OF PAST SEPTEMBERS.

The table shows the mean temperature, the number of days above 85 degrees, for the past twelve Septembers in southeastern Nebraska; they are found by averaging the number reported at the different stations. It also shows the highest temperature and the lowest recorded anywhere in the state by standard self-registering thermometers:

| SEPTEMBER. | MEAN TEMP. | ABOVE 85° | HIGHEST TEMP. | LOWEST TEMP. |
|---|---|---|---|---|
| 1878 | 65.5 | 5.3 | 91.0 | 33.0 |
| 1879 | 61.1 | 3.9 | 91.0 | 28.0 |
| 1880 | 64.2 | 3.7 | 93.0 | 34.0 |
| 1881 | 67.3 | 10.3 | 99.0 | 36.0 |
| 1882 | 67.5 | 10.8 | 94.0 | 12.0 |
| 1883 | 60.8 | 2.0 | 91.0 | 37.0 |
| 1884 | 67.9 | 6.3 | 92.0 | 39.0 |
| 1885 | 64.0 | 5.0 | 92.0 | 43.0 |
| 1886 | 65.4 | 9.2 | 93.0 | 34.0 |
| 1887 | 64.4 | 6.5 | 94.0 | 30.0 |
| 1888 | 64.6 | 5.0 | 100.0 | 26.0 |
| 1889 | 61.6 | 3.0 | 101.0 | 24.0 |

The following table shows the precipitation, or depth in inches, of rain and melted snow or hail, the number of cloudy and of clear days. Days are counted cloudy when the sky is four-fifths overcast:

| SEPTEMBER. | PRECIPITATION. | DAYS OF PRECIP. | CLOUDY DAYS. | CLEAR DAYS. |
|---|---|---|---|---|
| 1878 | 2.58 | 4.3 | 1.9 | 18.7 |
| 1879 | 1.86 | 5.1 | 1.5 | 19.0 |
| 1880 | 3.41 | 6.9 | 3.5 | 16.5 |
| 1881 | 4.05 | 6.5 | 3.8 | 17.2 |
| 1882 | 0.92 | 1.9 | 1.4 | 19.3 |
| 1883 | 3.38 | 7.1 | 6.4 | 14.0 |
| 1884 | 2.99 | 5.8 | 6.3 | 13.0 |
| 1885 | 2.34 | 6.2 | 6.0 | 16.4 |
| 1886 | 3.59 | 9.9 | 4.9 | 12.5 |
| 1887 | 3.04 | 7.9 | 7.5 | 9.0 |
| 1888 | 0.23 | 2.0 | 4.7 | 15.3 |
| 1889 | 1.76 | 4.8 | 9.1 | 12.9 |

### WEATHER SIGNALS.

The daily temperature and weather predictions of the chief signal officer have been distributed by this service to the following stations, where flags have been displayed for the benefit of the public.

The following are the percentages of correct predictions, both as to temperature and weather:

| STATION. | DISPLAYMAN. | WEATHER. | TEMP. |
|---|---|---|---|
| Beatrice | F. H. Schmidt | 92.3 | 96.2 |
| Chester | Stephen Forsdick | ........ | ........ |
| Craig | E. F. Irwin | 84.5 | 96.2 |
| David City | E. B. Taylor | 80.0 | 92.0 |
| Falls City | A. B. Newkirk | 72.2 | 50.0 |
| Grand Island | Barney Kobbeck | 85.7 | 85.7 |
| Hartington | U. K. Loose | 84.5 | 96.2 |
| Hebron | M. S. Phillips | 100.0 | 100.0 |
| Holdrege | J. D. Cogswell | 80.8 | 72.2 |
| Juniata | S. L. Brass | 92.3 | 86.9 |
| Merna | M. Casteel | 92.3 | 80.8 |
| Nebraska City | J. B. Parmelee | ........ | ........ |
| Oakdale | The Sentinel | 80.0 | 96.0 |
| Plattsmouth | J. N. Wise | 100.0 | 95.2 |
| Tobias | S. Larson | 72.2 | 96.2 |
| West Point | E. Briggs | ........ | ........ |

This gives as the percentage of correct predictions of the state:

| | |
|---|---|
| Temperature | 88.0 |
| Weather | 85.9 |
| Mean | 87.0 |

## MONTHLY MISCELLANEOUS DATA.

| STATIONS. | OBSERVERS. | TEMPERATURE OF THE AIR IN DEGREES FAHRENHEIT. | | | | | Precipitation in inches. | | No. rainy days, .01 inch or more. | No. of cloudy days. | No. of fair days. | No. of clear days. | Prevailing direction of the wind. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Monthly mean from— | | | Maximum. | Minimum. | Monthly, including melted snow. | Total monthly snow-fall. | | | | | |
| | | Tri-daily observations. | Noon observations. | Max and Min. | | | | | | | | | |
| SOUTHEAST SECTION. | | | | | | | | | | | | | |
| Ashland | Geo. Shedd | 63.5 | ...... | ...... | 92 | 33 | 2.08 | ...... | 7 | 10 | 5 | 15 | S |
| *Crete, *a* | G. I. Gilbert | 61.3 | ...... | 63.0 | 91 | 34 | 1.97 | ...... | 5 | 7 | 12 | 11 | SE |
| *Crete, *b* | Observer S. S. | ...... | ...... | 63.0 | 91 | 34 | 1.97 | ...... | 5 | 12 | 6 | 12 | NW |
| David City | E. B. Taylor | 53.0 | ...... | ...... | 84 | 33 | 1.60 | ...... | 3 | ...... | ...... | ...... | NW |
| Fairbury | Dr. Humphrey | ...... | ...... | ...... | 86 | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| *Falls City | A. B. Newkirk | 61.9 | ...... | 63.9 | 94 | 34 | 1.12 | ...... | 4 | 8 | 12 | 10 | ...... |
| Howe | G. D. Carrington | 65.0 | ...... | ...... | 89 | 32 | 1.08 | ...... | 7 | 10 | 5 | 15 | ...... |
| *Lincoln | F. F. Almy | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Marquette, *a* | John Ellis | ...... | 73.0 | ...... | 89 | 38 | 3.17 | ...... | 5 | ...... | ...... | ...... | ...... |
| Marquette, *b* | J. Pinkerton | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Minden | Joel Hull | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | 10 | ...... | ...... | ...... |
| Nebraska City | J. B. Parmelee | ...... | ...... | ...... | ...... | ... | 1.22 | ...... | 4 | ...... | ...... | ...... | ...... |
| Syracuse | P. W. Risser | 63.8 | ...... | 64.7 | 89 | 37 | 1.03 | ...... | 4 | ...... | ...... | ...... | ...... |
| Tecumseh | W. L. Dunlap | ...... | ...... | 64.1 | 82 | 39 | 1.50 | ...... | 2 | ...... | ...... | ...... | ...... |
| Weeping Water | Garry Treat | 61.1 | ...... | ...... | 89 | 31 | 2.40 | ...... | 7 | 7 | 11 | 6 | SE |
| Weston | J. R. Campbell | 62.2 | ...... | ...... | 89 | 37 | 1.84 | ...... | 4 | 10 | ...... | 20 | S |
| Mean for section | ...... | 61.6 | ...... | ...... | ...... | ... | 1.76 | ...... | 4.8 | 9.1 | 7.3 | 12.9 | ...... |
| NORTHEAST SECTION. | | | | | | | | | | | | | |
| Craig | E. F. Irwin | 61.2 | ...... | ...... | 83 | 36 | 1.61 | ...... | 7 | 8 | 10 | 12 | S |
| Creighton | Dr. Geo. Roberts | 57.5 | ...... | ...... | 101 | 32 | 3.70 | ...... | 7 | ...... | ...... | ...... | NW |
| De Soto | Chas. Seltz | 60.1 | ...... | ...... | 87 | 33 | 0.85 | ...... | 8 | 11 | 10 | 9 | ...... |
| Fort Omaha | ...... | ...... | ...... | 62.7 | 87 | 35 | 1.79 | ...... | 5 | ...... | ...... | ...... | ...... |
| *Fremont | I. E. Heaton | 63.2 | ...... | 66.0 | 86 | 39 | 1.40 | ...... | 5 | ...... | ...... | ...... | ...... |
| Oakdale | G. S. Clingman | 57.3 | ...... | 59.0 | 89 | 29 | 1.47 | ...... | 7 | 9 | 5 | 16 | NW |
| *Omaha | Observer S. S. | 63.6 | ...... | ...... | 88 | 38 | 1.74 | ...... | 7 | 11 | 8 | 11 | S |
| Ponca | A. N. Porter | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Sioux City, Iowa | Observer S. S. | 61.0 | ...... | ...... | 85 | 36 | 1.71 | ...... | 10 | 7 | 11 | 12 | S |
| Stuart | C. E. Barber | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| West Point | E. G. Bruner | ...... | 70.0 | ...... | 86 | ... | ...... | ...... | ...... | ...... | ...... | ...... | SE |
| *Yankton, Dakota | Observer S. S. | 60.7 | ...... | ...... | 88 | 34 | 2.31 | ...... | 7 | 9 | 8 | 13 | NW |
| Mean for section | ...... | 60.6 | ...... | ...... | ...... | ... | 1.85 | ...... | 7.0 | 9.1 | 8.7 | 12.1 | ...... |
| Mean for East Neb | ...... | 61.1 | ...... | ...... | ...... | ... | 1.80 | ...... | 5.9 | 9.1 | 8.0 | 12.5 | ...... |
| LOWER LOUP. | | | | | | | | | | | | | |
| Genoa | G. S. Truman | ...... | ...... | 60.1 | 88 | 36 | 1.76 | ...... | 6 | 7 | 8 | 15 | ...... |
| Grand Island | T. A. Watson | 58.1 | ...... | ...... | 82 | 38 | 0.87 | ...... | 7 | ...... | ...... | ...... | ...... |
| North Loup | E. W. Black | 57.5 | ...... | ...... | 87 | 31 | 1.60 | ...... | 7 | ...... | ...... | ...... | ...... |
| Palmer | C. Shieldstream | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| *Ravenna | E. Smith | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| West Hill | J. L. Truman | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| UPPER LOUP. | | | | | | | | | | | | | |
| Alliance | T. D. Shurtz | ...... | ...... | 59.6 | 93 | 33 | 1.56 | ...... | 2 | ...... | ...... | ...... | ...... |
| Ansley | Peter Fowlie | 58.9 | ...... | 60.6 | 89 | 31 | 0.40 | ...... | 6 | ...... | ...... | ...... | ...... |
| Bingham | W. C. Wood | 56.6 | ...... | 56.0 | 93 | 28 | 1.75 | ...... | ...... | ...... | ...... | ...... | ...... |
| Mullen | F. L. Mary | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Sargent | J. S. Spooner | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Mean for Loup section | ...... | 57.8 | ...... | ...... | ...... | ... | 1.41 | ...... | 5.6 | ...... | ...... | ...... | ...... |
| NIOBRARA. | | | | | | | | | | | | | |
| Fort Niobrara | ...... | ...... | ...... | 58.0 | 98 | 26 | 1.39 | ...... | 7 | ...... | ...... | ...... | S |
| Fort Robinson | Hospital Steward | ...... | ...... | 58.3 | 97 | 24 | 0.38 | ...... | 5 | ...... | ...... | ...... | NW |
| Kennedy | Mrs. Erickson | 59.8 | ...... | ...... | 96 | 34 | 1.28 | ...... | 4 | 7 | 5 | 18 | NW |
| *Hay Springs | Wm. Waterman | 54.6 | ...... | 56.0 | 95 | 24 | 0.64 | ...... | 3 | 6 | 7 | 17 | NW |
| *Valentine | Observer S. S. | 58.4 | ...... | ...... | 97 | 33 | 1.71 | ...... | 11 | 9 | 9 | 12 | NW |
| REPUBLICAN. | | | | | | | | | | | | | |
| Culbertson | Mrs. Wibley | 57.0 | ...... | ...... | ...... | 30 | 0.83 | ...... | 3 | 3 | 13 | 12 | N |
| Franklin | W. A. Harshbarger | ...... | ...... | ...... | 96 | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Red Willow | Mrs. R. Buck | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Superior | E. H. Kern | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Stratton | J. B. Slinn | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| UPPER PLATTE. | | | | | | | | | | | | | |
| Fort Sidney | ...... | ...... | ...... | 59.8 | 100 | 25 | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Gering | J. P. Finley | 60.7 | ...... | ...... | 97 | 32 | 0.21 | ...... | 3 | ...... | ...... | ...... | NW |
| *Kimball | D. Henderson | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Lexington | Geo. T. Cain | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| *North Platte | Observer S. S. | 60.0 | ...... | ...... | 90 | 31 | 2.57 | ...... | 6 | 8 | 8 | 14 | SE |
| Sidney | Oberfelder & Co. | ...... | ...... | ...... | ...... | ... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Mean for West Neb | ...... | 58.1 | ...... | ...... | ...... | ... | 1.06 | ...... | 5.6 | 6.5 | 9.2 | 13.7 | ...... |
| Mean for State | ...... | 59.5 | ...... | ...... | ...... | ... | 1.52 | ...... | 5.6 | 8.2 | 8.4 | 13.0 | ...... |

***Maximum and minimum temperature from self-registering thermometer. T in precipitation column indicates trace.**

## OCTOBER.

The month of October has developed no remarkable features; the temperature has been on the whole a little cooler than usual, with rather wide range between highest and lowest, yet with less than usual freezing days. The precipitation has been less than normal.

### TEMPERATURE.

The mean temperature for the state has been 94.7° and very uniform throughout the state. The highest temperature came at the opening of the month, and reached 91° at Alliance. The lowest temperatures came on the 20th and 26th of the month, with a minimum of 11° at Ansley. The maximum is higher than for any October since 1879, and the minimum has been lower but once, in October, 1887.

### PRECIPITATION.

The precipitation has exceeded two inches only at Valentine and at Falls City, the extreme northern and the extreme southeastern parts of the state. A fall of snow occurred at the close of the month, amounting to six inches in the western portion. The number of rainy days is less than usual, but the number of cloudy days greater.

### NOTES FROM OBSERVERS.

"More rain is needed badly. Corn is now being cribbed and is yielding about forty-eight bushels per acre. Average quality, though inclined to be light and 'chaffy' on account of dry weather in fall and latter part of summer."—E. F. IRWIN, Craig.

"At last in the eleventh hour the much needed rain set in, which gives the fall grain a good start and most excellent for fall plowing."—P. W. RISSER, Syracuse.

"Very dry and dusty month."—J. R. CAMPBELL, Weston.

"Drouth up to 20th; corn fields dry enough to burn; latter part of month cloudy and closes wet."—G. D. CARRINGTON, Howe.

"First ice of the season on the 6th."—G. S. TRUMAN, Genoa.

"On the nights of the 19th, 20th, 25th, and 26th, quite a hard freeze with more or less frost every night since the middle of the month."—T. A. WATSON, Grand Island.

"Ice found without apparent frost on the 5th, 7th, and 11th."—WM. WATERMAN, Hay Springs.

"Winter holds off later than usual. First snow of season on 29th, melted as it fell, light flurry; 31st, same result."—S. W. REYNOLDS, Fort Robinson.

### TABLES.

The following are the total number of miles traveled by the wind during the month, the maximum and average velocity per hour, and the monthly mean barometer:

| STATIONS. | MILES. | MAX. | MEAN. | BAR. |
|---|---|---|---|---|
| Crete | ............ | ............ | ............ | ............ |
| Lincoln | ............ | ............ | ............ | ............ |
| North Platte | 6290 | 36 | 8.5 | 30.15 |
| Omaha | 5094 | 45 | 6.8 | 30.17 |
| Sioux City, Iowa | 6928 | 36 | 9.3 | 30.15 |
| Valentine | 6920 | 46 | 9.3 | 30.11 |
| Yankton, Dakota | 4900 | 31 | 6.6 | 30.14 |

### COMPARISON OF PAST OCTOBERS.

The table shows the mean temperature, the number of days below 32 degrees, for the past twelve Octobers in southeastern Nebraska; they are found by averaging the number reported at the different stations. It also shows the highest temperature and the lowest recorded anywhere in the state by standard self-registering thermometers:

| OCTOBER. | MEAN TEMP. | BELOW 32° | HIGHEST TEMP. | LOWEST TEMP. |
|---|---|---|---|---|
| 1878 | 50.2 | 8.5 | 81.0 | 15.0 |
| 1879 | 60.7 | 6.6 | 91.0 | 20.0 |
| 1880 | 48.9 | 3.7 | 82.0 | 23.0 |
| 1881 | 52.8 | 3.8 | 90.0 | 26.0 |
| 1882 | 54.9 | 6.4 | 83.0 | 31.0 |
| 1883 | 48.6 | 6.4 | 81.0 | 26.0 |
| 1884 | 55.9 | 5.3 | 86.0 | 26.0 |
| 1885 | 48.7 | 10.4 | 82.0 | 23.0 |
| 1886 | 56.4 | 5.7 | 87.0 | 16.0 |
| 1887 | 50.0 | 5.7 | 90.0 | 2.0 |
| 1888 | 49.6 | 4.5 | 86.0 | 12.0 |
| 1889 | 50.0 | 3.3 | 91.0 | 11.0 |

The following table shows the precipitation, or depth in inches, of rain and melted snow or hail, the number of cloudy and of clear days. Days are counted cloudy when the sky is four-fifths overcast:

| OCTOBER. | PRECIPITATION. | DAYS OF PRECIP. | CLOUDY DAYS. | CLEAR DAYS. |
|---|---|---|---|---|
| 1878 | 0.47 | 1.8 | 6.0 | 15.3 |
| 1879 | 1.58 | 3.2 | 2.9 | 19.5 |
| 1880 | 2.06 | 4.2 | 8.1 | 14.5 |
| 1881 | 3.62 | 8.7 | 12.9 | 9.6 |
| 1882 | 2.79 | 6.4 | 5.4 | 12.4 |
| 1883 | 4.58 | 9.4 | 12.8 | 8.8 |
| 1884 | 2.36 | 5.9 | 5.0 | 17.6 |
| 1885 | 2.25 | 5.1 | 4.4 | 17.5 |
| 1886 | 1.25 | 3.6 | 8.8 | 18.3 |
| 1887 | 0.72 | 2.5 | 8.0 | 14.5 |
| 1888 | 0.99 | 3.4 | 5.5 | 13.8 |
| 1889 | 1.01 | 4.2 | 12.0 | 13.7 |

### WEATHER SIGNALS.

The daily temperature and weather predictions of the chief signal officer have been distributed by this service to the following stations, where flags have been displayed for the benefit of the public.

**The following are the percentages of correct predictions both as to temperature and weather:**

| STATION. | DISPLAYMAN. | WEATHER. | TEMP. |
|---|---|---|---|
| **Beatrice** | F. H. Schmidt | 88.9 | 100.0 |
| **Chester** | Stephen Forsdick | 70.4 | 69.2 |
| **Craig** | E. F. Irwin | 88.9 | 92.6 |
| **David City** | E. B. Taylor | 77.8 | 88.9 |
| **Falls City** | A. B. Newkirk | 62.9 | 70.4 |
| **Fremont** | Marvin Lord | 85.7 | 78.6 |
| **Grand Island** | Barney Kobbeck | 70.4 | 81.5 |
| **Hartington** | U. K. Loose | 70.4 | 100.0 |
| **Hebron** | M. S. Phillips | 81.5 | 88.9 |
| **Holdrege** | J. D. Cogswell | | |
| **Juniata** | S. L. Brass | 88.9 | 88.9 |
| **Merna** | M. Casteel | | |
| **Nebraska City** | J. B. Parmelee | | |
| **Niobrara** | A. B. Yantis | 88.9 | 96.3 |
| **Oakdale** | The Sentinel | 85.2 | 88.8 |
| **Plattsmouth** | J. N. Wise | 74.1 | 88.9 |
| **Rising City** | C. E. Wilcox | 83.3 | 100.0 |
| **Tobias** | S. Larson | | |
| **West Point** | E. Briggs | | |

**This gives as the percentage of correct predictions of the state:**

| | |
|---|---|
| **Temperature** | 88.0 |
| **Weather** | 79.4 |
| Mean | 83.7 |

## MONTHLY MISCELLANEOUS DATA.

| STATIONS. | OBSERVERS. | *Temperature. (Fahrenheit.)* | | | *Precipitation in inches.* | | *No. of rainy days* | *Monthly mean humidity* | *No. of cloudy days* | *No. of fair days* | *No. of clear days* | *Prevailing direction of the wind.* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Maximum | Minimum | Mean | Monthly, including melted snow | Total monthly snow fall | | | | | | |
| SOUTHEAST SECTION. | | ° | ° | ° | | | | | | | | |
| Ashland | Geo. Shedd | 84 | 23 | 51.3 | 0.15 | 0.0 | 2 | ...... | 10 | 4 | 17 | NE |
| *Crete, *a* | G. I. Gilbert | 83 | 22 | 50.7 | 0.87 | 0.0 | 3 | ...... | 12 | 8 | 11 | N |
| *Crete, *b* | Observer S. S. | 83 | 22 | 51.6 | 0.37 | 0.0 | 3 | ...... | 13 | 5 | 13 | E |
| David City | E. B. Taylor | 82 | 18 | 42.0 | 1.50 | 1.5 | 7 | ...... | ...... | ...... | ...... | SE |
| Fairbury | Dr. Humphrey | ...... | 32 | ...... | 1.07 | 0.0 | 7 | ...... | ...... | ...... | ...... | ...... |
| *Falls City | Robert Clegg | 89 | 38 | 50.0 | 2.48 | 0.0 | 3 | 55 | 16 | 3 | 12 | ...... |
| Howe | G. D. Carrington | 90 | 27 | 53.0 | 0.68 | 0.0 | 5 | ...... | 13 | 4 | 14 | S |
| *Lincoln | F. F. Almy | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Marquette | John Ellis | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Minden | Joel Hull | 78 | 20 | 49.4 | 1.85 | 2.5 | 6 | ...... | 11 | 4 | 16 | SE |
| Nebraska City | J. B. Parmelee | 82 | 24 | 49.7 | 0.95 | 0.0 | 5 | ...... | ...... | ...... | ...... | ...... |
| Syracuse | P. W. Risser | 84 | 26 | 52.0 | 1.41 | 0.0 | 6 | ...... | ...... | ...... | ...... | ...... |
| Tecumseh | W. L. Dunlap | 81 | 35 | 54.0 | 1.40 | ...... | 8 | 8 | 13 | 9 | ...... | N |
| Weeping Water | Garry Treat | 83 | 21 | 50.0 | T | ...... | 0 | ...... | 9 | 4 | 10 | ...... |
| Weston | J. R. Campbell | 82 | 31 | 51.8 | 0.62 | 1.0 | 2 | ...... | ...... | ...... | ...... | S |
| Mean for section | ...... | ...... | ...... | 50.0 | 1.01 | ...... | 4.2 | ...... | 12.0 | 4.0 | 13.7 | ...... |
| NORTHEAST SECTION. | | | | | | | | | | | | |
| Craig | E. F. Irwin | 82 | 22 | 50.3 | 0.20 | 0.0 | 4 | 70 | 11 | 6 | 14 | SE |
| Creighton | Dr. Geo. Roberts | 80 | 15 | 45.2 | 0.19 | 0.0 | 3 | ...... | ...... | ...... | ...... | S |
| De Soto | Chas. Seltz | 83 | 24 | 50.1 | 0.74 | 0.0 | 6 | ...... | 9 | 9 | 13 | N |
| Fort Omaha | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| *Fremont | I. E. Heaton | 78 | 23 | 50.4 | 0.45 | 0.0 | 3 | ...... | ...... | ...... | ...... | ...... |
| Oakdale | G. S. Clingman | 83 | 14 | 46.3 | 0.29 | 0.0 | 3 | 71 | 12 | 7 | 12 | NW |
| *Omaha | Observer S. S. | 84 | 28 | 52.2 | 0.34 | ...... | 4 | ...... | 10 | 8 | 13 | NW |
| Sioux City, Iowa | Observer S. S. | 84 | 22 | 50.4 | 0.21 | 0.0 | 6 | ...... | 9 | 9 | 13 | SE |
| Stuart | C. E. Barber | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| West Point | E. G. Bruner | 85 | ...... | ...... | 0.02 | 0.0 | ...... | ...... | ...... | ...... | ...... | S |
| *Yankton, Dakota | Observer S. S. | 80 | 22 | 50.4 | 0.48 | 0.0 | 4 | ...... | 14 | 8 | 9 | SE |
| Mean for section | ...... | ...... | ...... | 49.9 | 0.33 | ...... | 4.3 | ...... | 10.6 | 8.0 | 12.4 | ...... |
| Mean for East Neb | ...... | ...... | ...... | 50.0 | 0.67 | ...... | 4.2 | ...... | 11.3 | 6.0 | 13.0 | ...... |
| LOWER LOUP. | | | | | | | | | | | | |
| Genoa | G. S. Truman | 79 | 25 | 50.1 | 0.58 | 0.0 | 5 | ...... | 12 | 4 | 15 | NW |
| Grand Island | T. A. Watson | 64 | 18 | 45.0 | 0.46 | 0.0 | 2 | ...... | 9 | 8 | 12 | SE |
| North Loup | E. W. Black | 88 | 15 | 49.6 | 0.45 | 0.0 | 4 | ...... | ...... | ...... | ...... | ...... |
| Palmer | C. Shieldstream | 80 | 20 | 45.6 | 0.50 | 0.0 | 1 | ...... | ...... | ...... | ...... | ...... |
| *Ravenna | E. Smith | 84 | 15 | 51.4 | 1.04 | ...... | 5 | ...... | 10 | 3 | 18 | S |
| West Hill | J. L. Truman | 83 | 25 | 51.3 | 0.46 | 0.0 | 4 | ...... | 12 | 6 | 13 | NW |
| UPPER LOUP. | | | | | | | | | | | | |
| Alliance | T. D. Shurtz | 91 | 25 | 53.0 | 1.15 | ...... | 3 | ...... | ...... | ...... | ...... | ...... |
| Ansley | Peter Fowlie | 86 | 11 | 49.3 | 0.60 | ...... | 1 | ...... | ...... | ...... | ...... | N |
| Bingham | W. C. Wood | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Mullen | F. L. Mary | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Sargent | J. S. Spooner | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Mean for Loup section | ...... | ...... | ...... | 49.4 | 0.66 | ...... | 3.1 | ...... | 11.0 | 5.2 | 14.5 | ...... |
| NIOBRARA. | | | | | | | | | | | | |
| Fort Niobrara | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Fort Robinson | Hospital Steward | 87 | 24 | 51.9 | 0.74 | T | 8 | ...... | ...... | ...... | ...... | NW |
| Kennedy | Mrs. Erickson | 84 | 29 | 49.9 | 1.70 | 1.0 | 4 | 9 | 4 | 18 | ...... | NW |
| *Hay Springs | Wm. Waterman | 84 | 22 | 46.9 | 0.60 | T | 4 | ...... | 5 | 11 | 14 | NW |
| *Valentine | Observer S. S. | 86 | 22 | 49.8 | 2.12 | ...... | 9 | 74 | 11 | 6 | 14 | SE |
| REPUBLICAN. | | | | | | | | | | | | |
| Culbertson | John Bailor | ...... | ...... | ...... | 1.30 | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Franklin | W. A. Harshbarger | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| UPPER PLATTE. | | | | | | | | | | | | |
| Fort Sidney | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Gering | J. P. Finley | 84 | 24 | 51.3 | 1.76 | 6.0 | 6 | ...... | ...... | ...... | ...... | NW |
| *Kimball | D. Henderson | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Lexington | J. M. Tipton | 72 | 19 | 47.5 | 0.37 | 0.5 | 3 | ...... | ...... | ...... | ...... | ...... |
| *North Platte | Observer S. S. | 88 | 23 | 50.0 | 0.31 | ...... | 4 | 71 | 8 | 15 | 8 | SE |
| Mean for West Neb | ...... | ...... | ...... | 49.6 | 0.98 | ...... | 5.7 | ...... | 8.0 | 10.7 | 12.0 | ...... |
| Mean for State | ...... | ...... | ...... | 49.7 | 0.83 | ...... | 4.3 | 67.5 | 10.6 | 6.5 | 13.3 | SE |

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* Maximum and minimum temperature from self-registering thermometer. T in precipitation column indicates trace.

## NOVEMBER.

The month of November has presented no remarkable features, unless it be the early occurrence of a considerable fall of snow. The precipitation and cloudiness have been a little above the normal; the temperature two or three degrees below.

### TEMPERATURE.

The mean for the month for southeastern Nebraska was 33.5°, which is two and a half degrees below the normal. The maximum for the month was 75 degrees at Alliance, and the minimum was 12° below zero at Fort Niobrara on the 12th of the month, following in the wake of the snow storm of the 11th and 12th. The mercury has only twice stood so high as 75° in November, viz.: in 1887 and 1888; it has only once fallen so low, which was in November of 1887, when it fell to 32° below zero.

### PRECIPITATION.

Over the western part of the state precipitation has not amounted to an inch; over an irregular area in the eastern part of the state it has exceeded an inch, with three limited localities of over two inches. On the first day of the month over the eastern part of the state there was a considerable fall of snow turning into rain; on the eleventh and twelfth there was a fall of snow over the central and western portions; the ground at the end of the month is bare, except in the northwest corner of the state, and also the west central part.

### NOTES FROM OBSERVERS.

"November has been a very pleasant month. Corn about all gathered now. Ground frozen up and is very dry. Temperature of wells 48°. Temperature of ground six feet below surface 44°."—E. F. IRWIN, Craig.

"The first snow of the season occurred on the morning of the 1st, turning into rain later in the day."—G. S. CLINGMAN, Oakdale.

"November came in like a terrible lion and went out like a gentle lamb. A favorable month, comparatively still and moderately cloudy, with only one severe storm, on the 1st, of melting snow and quite heavy rain aggregating 2.62 inches. The ground is in fair condition for another year's crops, and is now frozen some two or three inches."—G. TREAT, Weeping Water.

"The month of November has been very pleasant, with the exception of one or two days; favorable to close up the year's work, which was improved by all. The average yield is very satisfactory in everything, especially the corn, which is above the average."—P. W. RISSER, Syracuse.

"Month dry and pleasant. Farmers busy gathering corn, which ranges from 40 to 80 bushels per acre."—G. D. CARRINGTON, Howe.

"Remarkably fine weather for harvesting the magnificent corn crop. Very dry after the first, but rains in the last days of October and first of November put ground in good condition for winter wheat, and filled streams, springs and wells." —W. L. DUNLAP, Tecumseh.

"More or less frost every night during the month except on the 21st."—T. A. WATSON, Grand Island.

"Remarkably mild weather for this section."—S. W. REYNOLDS, Fort Robinson.

### TABLES.

The following are the total number of miles traveled by the wind during the month, the maximum and average velocity per hour, and the monthly mean barometer:

| STATION. | MILES. | MAX. | MEAN. | BAR. |
|---|---|---|---|---|
| Crete | 7057 | 40 | 9.8 | |
| Lincoln | | | | |
| North Platte | 6110 | 42 | 8.5 | 30.23 |
| Omaha | 7075 | 45 | 8.4 | 30.19 |
| Sioux City, Iowa | 6507 | 32 | 9.0 | 30.19 |
| Valentine | 7133 | 60 | 9.9 | 30.22 |
| Yankton, Dakota | 5390 | 29 | 7.5 | 30.16 |

### COMPARISON OF PAST NOVEMBERS.

The table shows the mean temperature, the number of days below 32 degrees, for the past twelve Novembers in southeastern Nebraska; they are found by averaging the number reported at the different stations. It also shows the highest temperature and the lowest recorded anywhere in the state by standard self-registering thermometers:

| NOVEMBER. | MEAN TEMP. | BELOW 32° | HIGHEST TEMP. | LOWEST TEMP. |
|---|---|---|---|---|
| 1878 | 40.8 | 18.4 | | |
| 1879 | 38.6 | 15.8 | 65.0 | 8.0 |
| 1880 | 25.3 | 22.4 | 66.0 | -7.0 |
| 1881 | 34.2 | 18.2 | 64.0 | 3.0 |
| 1882 | 38.3 | 20.7 | 74.0 | 2.0 |
| 1883 | 37.8 | 20.1 | 67.0 | 6.0 |
| 1884 | 37.2 | 21.3 | 69.0 | 2.0 |
| 1885 | 38.1 | 20.4 | 72.0 | 19.0 |
| 1886 | 33.8 | 24.3 | 74.0 | 5.0 |
| 1887 | 36.7 | 14.7 | 87.0 | -32.0 |
| 1888 | 37.2 | 21.0 | 80.0 | 1.0 |
| 1889 | 33.5 | 23.0 | 75.0 | -12.0 |

The following table shows the precipitation, or depth in inches, of rain and melted snow or hail, the number of cloudy and of clear days. Days are counted cloudy when the sky is four-fifths overcast:

| NOVEMBER. | PRECIPITATION. | DAYS OF PRECIP. | CLOUDY DAYS. | CLEAR DAYS. |
|---|---|---|---|---|
| 1878 | 0.73 | 1.6 | 3.1 | 16.3 |
| 1879 | 2.62 | 4.7 | 5.7 | 14.6 |
| 1880 | 0.70 | 4.0 | 4.1 | 15.9 |
| 1881 | 1.26 | 3.3 | 5.3 | 12.5 |
| 1882 | 0.82 | 2.8 | 3.1 | 15.7 |
| 1883 | 0.26 | 1.2 | 2.6 | 19.5 |
| 1884 | 0.17 | 2.2 | 5.6 | 16.8 |
| 1885 | 1.09 | 3.3 | 7.3 | 12.8 |
| 1886 | 1.26 | 4.5 | 6.8 | 16.2 |
| 1887 | 0.81 | 1.3 | 6.0 | 16.0 |
| 1888 | 0.42 | 2.0 | 7.0 | 16.2 |
| 1889 | 1.37 | 3.3 | 6.9 | 13.9 |

### WEATHER SIGNALS.

The daily temperature and weather predictions of the chief signal officer have been distributed by this service to the following stations, where flags have been displayed for the benefit of the public.

The following are the percentages of correct predictions both as to temperature and weather:

| STATION. | DISPLAYMAN. | WEATHER. | TEMP. |
|---|---|---|---|
| Arapahoe | J. W. Tomblin | 91.3 | 91.3 |
| Beatrice | F. H. Schmidt | 96.0 | 96.0 |
| Chester | Stephen Forsdick | ........ | ........ |
| Coleridge | F. L. Hicks | 70.8 | 91.7 |
| Craig | E. F. Irwin | 84.0 | 92.0 |
| David City | E. B. Taylor | 84.6 | 88.4 |
| Falls City | A. B. Newkirk | 80.0 | 50.0 |
| Fremont | Marvin Lord | 88.0 | 72.0 |
| Grand Island | Barney Kobbeck | 84.0 | 76.0 |
| Hartington | U. K. Loose | ........ | ........ |
| Hebron | M. S. Phillips | 96.0 | 92.0 |
| Holdrege | J. D. Cogswell | ........ | ........ |
| Juniata | S. L. Brass | 84.0 | 92.0 |
| Merna | M. Casteel | 88.0 | 88.0 |
| Nebraska City | J. B. Parmelee | ........ | ........ |
| Niobrara | A. B. Yantis | 76.0 | 92.0 |
| Oakdale | The Sentinel | 80.0 | 88.0 |
| Paxton | R. D. Harris | 70.0 | 90.0 |
| Plattsmouth | J. N. Wise | 77.8 | 100.0 |
| Rising City | C. E. Wilcox | 92.0 | 96.0 |
| Tobias | S. Larson | 87.0 | 83.3 |
| West Point | E. Briggs | 86.4 | 100.0 |

This gives as the percentage of correct predictions of the state:

| | |
|---|---|
| Temperature | 87.7 |
| Weather | 84.2 |
| Mean | 86.0 |

## MONTHLY MISCELLANEOUS DATA.

| STATIONS. | OBSERVERS. | *Temperature (Fahrenheit.)* | | | *Precipitation in inches.* | | *No. of rainy days* | *Monthly mean humidity* | *No. of cloudy days* | *No. of fair days* | *No. of clear days* | *Prevailing direction of the wind.* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Maximum | Minimum | Mean | Monthly, including melted snow | Total monthly snow fall | | | | | | |
| **SOUTHEAST SECTION.** | | o | o | o | | | | | | | | |
| Ashland | Geo. Shedd | 58 | 8 | 35.2 | 1.71 | ...... | 3 | ...... | 7 | 6 | 17 | S |
| *Crete, *a* | G. I. Gilbert | 62 | 4 | 33.3 | 1.75 | 5.5 | 3 | ...... | 9 | 8 | 13 | NW |
| *Crete, *b* | Observer S. S | 62 | 4 | 35.6 | 1.7 | 6.0 | 3 | ...... | 9 | 10 | 11 | NW |
| David City | E. B. Taylor | 60 | 0 | 24.0 | 1.30 | ...... | 3 | ...... | ...... | ...... | ...... | NW |
| Fairfield | P. B. Gaylord | 52 | 7 | ........ | 1.80 | ...... | 3 | ...... | ...... | ...... | ...... | ...... |
| Fairbury | Dr. Humphrey | 57 | 10 | ........ | 0.66 | 3.0 | ...... | ...... | ...... | | ...... | ...... |
| *Falls City | Robert Clegg | 62 | 6 | 38.1 | 0.75 | ...... | 1 | 70 | ...... | ...... | ...... | N |
| Howe | G. D. Carrington | 56 | 8 | 36.0 | 1.51 | ...... | 4 | ...... | 11 | 8 | 11 | S |
| *Lincoln | F. F. Almy | ...... | ...... | ........ | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Marquette | John Ellis | 56 | 4 | ........ | 2.66 | 10.5 | 6 | ...... | ...... | ...... | ...... | ...... |
| Minden | Joel Hull | 68 | 0 | 32.2 | 1.50 | 7.7 | 4 | ...... | 8 | 8 | 14 | N |
| Nebraska City | J. B. Parmelee | 64 | 5 | 34.9 | 0.74 | ...... | 3 | ...... | ...... | ...... | ...... | ...... |
| Syracuse | P. W. Risser | 61 | 9 | 35.5 | 0.42 | 3.0 | 1 | ...... | ...... | ...... | ...... | ...... |
| Tecumseh | W. L. Dunlap | 55 | 9 | 34.9 | 0.60 | 0.0 | 2 | ..... | ...... | ...... | ...... | NW |
| Weeping Water | Garry Treat | 63 | 8 | 32.9 | 2.62 | 4.0 | 6 | ...... | 6 | 8 | 6 | ...... |
| Weston | J. R. Campbell | 65 | 11 | 31.0 | 0.42 | 1.0 | 3 | ...... | 5 | 0 | 25 | N |
| Mean for section | ...... | ...... | ...... | 33.5 | 1.37 | 5.0 | 3.3 | ...... | 6.9 | 6.0 | 13.9 | ...... |
| **NORTHEAST SECTION.** | | | | | | | | | | | | |
| Craig | E. F. Irwin | 60 | 5 | 32.3 | 2.16 | 9.8 | 4 | 77 | 7 | 15 | 8 | NW |
| Creighton | Dr. Geo. Roberts | 58 | 0 | 28.1 | 0.61 | 1.0 | 4 | ...... | ...... | ...... | ...... | NW |
| De Soto | Chas. Seltz | 56 | 7 | 33.4 | 1.38 | 13.8 | 4 | 75 | 4 | 18 | 8 | N |
| Fort Omaha | ...... | 60 | 4 | 33.7 | 1.40 | ...... | 3 | ...... | ...... | ...... | ...... | ...... |
| *Fremont | I. E. Heaton | 58 | 7 | 33.1 | 0.28 | 1.7 | 5 | ...... | ...... | ...... | ...... | ...... |
| Oakdale | G. S. Clingman | 60 | 0 | 28.2 | 0.78 | 2.0 | 4 | ...... | 8 | 9 | 13 | NW |
| *Omaha | Observer S. S | 60 | 7 | 35.3 | 0.87 | ...... | 2 | ...... | 8 | 11 | 11 | NW |
| Sioux City, Iowa | Observer S. S | 58 | 2 | 33.0 | 1.99 | ...... | 6 | ...... | 9 | 10 | 11 | NW |
| Stuart | C. E. Barber | ...... | ...... | ........ | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| West Point | E. G. Bruner | 71 | ...... | ........ | 2.20 | 3.1 | 2 | ...... | ...... | ...... | ...... | S |
| *Yankton, Dakota | Observer S. S | 60 | 0 | 32.4 | 1.04 | ..... | 6 | 76 | 10 | 8 | 12 | NW |
| Mean for section | ...... | ...... | ...... | 32.2 | 1.27 | 5.2 | 4.0 | ...... | 7.7 | 11.8 | 10.5 | ...... |
| Mean for East Neb | ...... | ...... | ...... | 32.8 | 1.32 | 5.1 | 3.6 | ...... | 7.3 | 8.9 | 12.2 | ...... |
| **LOWER LOUP.** | | | | | | | | | | | | |
| Genoa | G. S. Truman | 55 | 7 | 32.1 | 1.30 | 7.0 | 5 | ...... | 6 | 10 | 14 | NW |
| Grand Island | T. A. Watson | ...... | 0 | 25.1 | 0.75 | 5.0 | 3 | ...... | 11 | 7 | 12 | NW |
| North Loup | E. W. Black | 55 | 2 | 31.4 | 0.69 | 1.5 | 4 | ...... | ...... | ...... | ...... | ...... |
| Palmer | C. Shieldstream | 62 | 0 | 30.5 | 1.60 | 2.0 | 3 | ...... | ...... | ...... | ...... | S |
| Ravenna | E. Smith | 65 | 4 | 32.6 | 0.95 | 4.8 | 6 | ...... | 5 | 9 | 16 | N |
| West Hill | J. L. Truman | 60 | 0 | 30.8 | 1.50 | 7.0 | 4 | ...... | 8 | 6 | 16 | NW |
| **UPPER LOUP.** | | | | | | | | | | | | |
| Alliance | T. D. Shurtz | 75 | 0 | 34.1 | ..... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Ansley | Peter Fowlie | 74 | 2 | 32.6 | 0.70 | 2.0 | 2 | ...... | ...... | ...... | ...... | ...... |
| Bingham | W. C. Wood | ...... | ...... | ........ | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Mullen | F. L. Mary | ...... | ...... | ........ | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Sargent | J. S. Spooner | ...... | −3 | ........ | 0.72 | 1.8 | 3 | ...... | ...... | ...... | ...... | ...... |
| Mean for Loup section | ...... | ...... | ...... | 31.2 | 1.03 | 5.1 | 3.8 | ...... | 7.5 | 8.0 | 14.5 | ...... |
| **NIOBRARA.** | | | | | | | | | | | | |
| Fort Niobrara | ...... | 64 | −12 | 28.9 | 0.60 | 6.0 | 1 | ...... | ...... | ...... | ...... | NW |
| Fort Robinson | Hospital Steward | 67 | 0 | 32.4 | 0.38 | 3.8 | 1 | ...... | ...... | ...... | ...... | NW |
| Kennedy | Mrs. Erickson | 68 | 0 | 32.4 | 1.10 | 1.2 | 2 | ...... | 1 | 11 | 18 | NW |
| *Hay Springs | W. Waterman | 64 | −6 | 28.0 | 0.28 | 3.3 | 2 | ...... | 1 | 11 | 9 | NW |
| *Valentine | Observer S. S | 67 | −2 | 31.5 | 0.56 | ...... | 5 | 66 | 9 | 7 | 14 | NW |
| **REPUBLICAN.** | | | | | | | | | | | | |
| Culbertson | John Bailor | ...... | ...... | ........ | 0.59 | ...... | 6 | ...... | ...... | ...... | ...... | ...... |
| Franklin | W. A. Harshbarger | 65 | −4 | 36.3 | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| **UPPER PLATTE.** | | | | | | | | | | | | |
| Fort Sidney | ...... | 65 | 0 | 32.9 | 0.00 | ..... | 0 | ...... | ...... | ...... | ...... | NW |
| Gering | J. P. Finley | 65 | 6 | 33.6 | 0.26 | 1.8 | 2 | ...... | ...... | ...... | ...... | NW |
| *Kimball | D. Henderson | ...... | ...... | ........ | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Lexington | J. M. Tipton | 63 | 3 | 34.0 | 0.35 | 4.0 | 2 | ...... | 5 | 5 | 20 | NW |
| *North Platte | Observer S. S | 62 | 2 | 33.0 | 0.20 | ...... | 5 | 69 | 6 | 17 | 7 | W |
| Mean for West Neb | ...... | ...... | ...... | 32.3 | 0.43 | 3.7 | 2.6 | ...... | 4.4 | 10.2 | 13.6 | ...... |
| Mean for State | ...... | ...... | ...... | 32.3 | 1.02 | 4.8 | 3.4 | 72.2 | 6.6 | 9.0 | 13.1 | NW |

*Maximum and minimum temperature from self-registering thermometer. T in precipitation column indicates trace.

## DECEMBER.

December has been a remarkable month in two respects, its very high temperature and the very small amount of precipitation.

### TEMPERATURE.

The mean temperature for the month for southeastern Nebraska was thirty-seven and nine-tenths degeees. The highest December mean heretofore recorded was thirty-three and two-tenths degrees in 1881; rarely has it been so high as thirty, and the normal for December is only twenty-four and a half; indeed, the mean temperature of December this year has been four degrees above that of November. The month has also been remarkable for the extreme range of its temperature; a maximum of eighty degrees is reported at Weston, while the northern part of the state was swept by a cold wave which gave minimum temperatures considerably below zero, reaching fourteen degrees below at Fort Niobrara.

### PRECIPITATION.

No December heretofore has given us so little precipitation. Very rarely is there less than half an inch, and the normal for December is three-quarters of an inch for southeastern Nebraska. The precipitation over the state for the past month has ranged from a little over an inch at two widely-remote stations in the northeast and southwest to a mere trace or none at all over the southeastern counties.

A thunderstorm on the 28th was a unique phenomenon for December.

### NOTES FROM OBSERVERS.

"The month of December has been very pleasant. Farmers were plowing ground and working on the roads until the 28th. Blue grass growing in yards, and some trees budding until same date."—E. F. IRWIN, Craig.

"December was more of a spring than a winter month. Old settlers say that it was the finest December they have experienced."—P. W. RISSER, Syracuse.

"The ground scarcely froze during the month, and farmers have improved the time plowing for next year's crops."—G. TREAT, Weeping Water.

"December has been very mild and pleasant; no severe storms or extremes of temperature. Farmers are yet gathering corn. Corn mostly in the crib."—G. D. CARRINGTON, Howe.

"Corn nearly all gathered. No frost in the ground. Too dry to plow. All kinds of live stock doing well. The low prices of farm products producing dullness in business."—J. HULL, Minden.

"December has been a remarkable month. Mercury ranging at noon generally between 47 and 67 degrees. No snow or rain. Corn crop generally gathered in fine condition."—DR. HUMPHREY, Fairbury.

"The average noon temperature for December, 1889, is 13.3 degrees above the normal for past twelve years."—E. SMITH, Ravenna.

"The past month has been remarkably warm and dry. It is nearly four degrees above the mean for last November, and the temperature has otherwise averaged above that of November. The weather has been exceedingly mild from beginning to end, the temperature being remarkably even."—G. S. CLINGMAN, Oakdale.

"We have had remarkably warm and fine weather until the storm on the 28th and that made the weather disagreeable for only one day."—MRS. M. G. ERICKSON, Kennedy.

"The roads are in fine shape and farmers are rushing thousands of bushels of grain into market at this point."—J. M. TIPTON, Lexington.

"Several days of violent dust storm during the month."—S. W. REYNOLDS, Fort Robinson.

### TABLES.

The following are the total number of miles traveled by the wind during the month, the maximum and average velocity per hour, and the monthly mean barometer:

| STATIONS. | MILES. | MAX. | MEAN. | BAR. |
|---|---|---|---|---|
| Crete | 8154 | 60 | 11.0 | 30.08 |
| Lincoln | 10515 | 42 | 14.1 | ......... |
| North Platte | 5327 | 48 | 7.2 | 30.05 |
| Omaha | 6440 | 48 | 8.7 | 30.06 |
| Sioux City, Iowa | 8013 | 48 | 10.8 | 30.04 |
| Valentine | 6834 | 60 | 9.2 | ......... |
| Yankton, Dakota | 5547 | 45 | 7.4 | 30.01 |

### COMPARISON OF PAST DECEMBERS.

The table shows the mean temperature, the number of days below 32 degrees, for the past twelve Decembers in southeastern Nebraska; they are found by averaging the number reported at the different stations. It also shows the highest temperature and the lowest recorded anywhere in the state by standard self-registering thermometers:

| DECEMBER. | MEAN TEMP. | BELOW ZERO | BELOW 32° | HIGHEST TEMP. | LOWEST TEMP. |
|---|---|---|---|---|---|
| 1878 | 20.5 | 3.7 | 30.0 | 52.0 | -8.0 |
| 1879 | 16.5 | 6.0 | 25.7 | 54.0 | -17.0 |
| 1880 | 18.3 | 7.6 | 28.2 | 58.0 | -26.0 |
| 1881 | 33.2 | 0.2 | 23.0 | 59.0 | -9.0 |
| 1882 | 24.8 | 5.3 | 28.4 | 57.0 | -15.0 |
| 1883 | 27.7 | 2.1 | 21.3 | 58.0 | -9.0 |
| 1884 | 16.0 | 11.2 | 26.2 | 65.0 | -18.0 |
| 1885 | 28.3 | 2.3 | 22.7 | 66.0 | 9.0 |
| 1886 | 18.0 | 8.8 | 25.5 | 57.0 | -12.0 |
| 1887 | 21.6 | 5.5 | 29.0 | 56.0 | -28.0 |
| 1888 | 31.6 | 0.1 | 27.0 | 70.0 | -8.0 |
| 1889 | 37.9 | 0.0 | 15.0 | 80.0 | -14.0 |

The following table shows the precipitation, or depth in inches, of rain and melted snow or hail, the number of cloudy and of clear days. Days are counted cloudy when the sky is four-fifths overcast:

| DECEMBER. | PRECIPITATION. | DAYS OF PRECIP. | CLOUDY DAYS. | CLEAR DAYS. |
|---|---|---|---|---|
| 1878 | 0.44 | 2.9 | 4.2 | 13.2 |
| 1879 | 0.91 | 3.2 | 7.7 | 13.1 |
| 1880 | 0.55 | 3.7 | 14.0 | 14.1 |
| 1881 | 0.90 | 3.4 | 6.9 | 11.2 |
| 1882 | 1.01 | 5.4 | 8.2 | 9.4 |
| 1883 | 0.71 | 8.4 | 7.5 | 12.7 |
| 1884 | 0.86 | 9.7 | 11.0 | 7.9 |
| 1885 | 1.19 | 4.4 | 8.0 | 14.4 |
| 1886 | 0.90 | 6.5 | 9.0 | 9.5 |
| 1887 | 0.87 | 6.0 | 9.0 | 7.0 |
| 1888 | 0.49 | 3.9 | 6.8 | 8.1 |
| 1889 | 0.14 | 1.1 | 9.7 | 11.2 |

### WEATHER SIGNALS.

The daily temperature and weather predictions of the chief signal officer have been distributed by this service to the following stations, where flags have been displayed for the benefit of the public.

The following are the percentages of correct predictions, both as to temperature and weather:

| STATIONS. | DISPLAYMEN. | WEATHER. | TEMP. |
|---|---|---|---|
| Arapahoe | J. W. Tomblin | 92.0 | 80.0 |
| Beatrice | F. H. Schmidt | 88.4 | 100.0 |
| Chester | Stephen Forsdick | ........ | ........ |
| Coleridge | G. D. Cord | 81.5 | 88.9 |
| Craig | E. F. Irwin | 72.0 | 96.0 |
| David City | E. B. Taylor | 65.4 | 84.6 |
| Falls City | Robert Clegg | 68.0 | 88.0 |
| Fremont | Marvin Lord | 92.0 | 80.4 |
| Grand Island | Barney Kobbeck | 76.0 | 96.0 |
| Hartington | U. K. Loose | 76.0 | 88.0 |
| Hebron | M. S. Phillips | 100.0 | 92.3 |
| Holdrege | J. D. Cogswell | ........ | ........ |
| Juniata | S. L. Brass | 89.6 | 79.3 |
| Merna | M. Casteel | ........ | ........ |
| Nebraska City | J. B. Parmelee | ........ | ........ |
| Niobrara | A. B. Yantis | 80.0 | 76.0 |
| Oakdale | The Sentinel | 68.0 | 80.0 |
| Paxton | R. D. Harris | 84.6 | 84.6 |
| Pender | T. P. Black | 75.0 | 100.0 |
| Plattsmouth | H. I. Streight | ........ | ........ |
| Rising City | C. D. Wilcox | 96.4 | 96.4 |
| Tobias | S. Larson | 91.7 | 95.8 |
| West Point | E. Bsiggs | 92.3 | 100.0 |

This gives as the percentage of correct predictions of the state:

| | |
|---|---|
| Temperature | 88.1 |
| Weather | 82.7 |
| Mean | 85.4 |

## MONTHLY MISCELLANEOUS DATA.

| STATIONS. | OBSERVERS. | TEMPERATURE FAHRENHEIT. | | | Precip'n in inches. | | Number of rainy days...... | Monthly mean humidity...... | Number of cloudy days...... | Number of fair days...... | Number of clear days...... | Prevailing direction of the wind...... |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Maximum...... | Minimum...... | Mean...... | Monthly, including melted snow...... | Total monthly snow fall...... | | | | | | |
| SOUTHEAST SECTION. | | ° | ° | ° | | | | | | | | |
| Ashland | Geo. Shedd | 69 | 7 | ...... | 0.10 | ...... | 1 | ...... | 9 | 5 | 17 | S |
| *Crete, *a* | G. I. Gilbert | 68 | 2 | 38.3 | T | T | 0 | ...... | 6 | 16 | 9 | S |
| *Crete, *b* | Observer S. S. | 68 | 2 | 39.9 | T | T | 0 | ...... | 13 | 10 | 8 | SE |
| David City | E. B. Taylor | 62 | 8 | 29.0 | 0.75 | ...... | 3 | ...... | ...... | ...... | ...... | S |
| Fairfield | P. B. Gaylord | 64 | 6 | 38.2 | T | T | 0 | ...... | ...... | ...... | ...... | S |
| Fairbury | Dr. Humphrey | 72 | 7 | ...... | .00 | 0 | 0 | ...... | ...... | ...... | ...... | ...... |
| *Falls City | Robert Clegg | 69 | 4 | 41.2 | .00 | 0 | 0 | 78 | 12 | 10 | 9 | ...... |
| Howe | G. D. Carrington | 70 | 0 | 41.9 | T | ...... | 0 | ...... | 12 | 4 | 15 | S |
| *Lincoln | F. F. Almy | 65 | 4 | 39.5 | .00 | 0 | 0 | ...... | 9 | 16 | 6 | S |
| Marquette | John Ellis | 61 | 7 | ...... | 0.40 | 1.8 | 2 | ...... | ...... | ...... | ...... | ...... |
| Minden | Joel Hull | 62 | 2 | 37.0 | 0.55 | ...... | 1 | ...... | 7 | 10 | 14 | S |
| Nebraska City | J. B. Parmelee | 71 | 5 | 40.2 | 0.04 | ...... | 2 | ...... | ...... | ...... | ...... | ...... |
| Saronville | A. B. Hollenbeck | 54 | 8 | 31.9 | 0.01 | 1.6 | 1 | ...... | ...... | ...... | ...... | S |
| Syracuse | P. W. Risser | 68 | 6 | 39.9 | 0.03 | ...... | 2 | ...... | ...... | ...... | ...... | ...... |
| Tecumseh | W. L. Dunlap | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Weeping Water | Garry Treat | 69 | 1 | 38.5 | 0.25 | ...... | 4 | ...... | 7 | 10 | 4 | NE |
| Weston | J. R. Campbell | 80 | 5 | 37.0 | 0.00 | 0 | 0 | ...... | 12 | 0 | 19. | N |
| Mean for section | ...... | ...... | ...... | 37.9 | 0.14 | 0.3 | 1.1 | ...... | 9.7 | 9.0 | 11.2 | ...... |
| NORTHEAST SECTION. | | | | | | | | | | | | |
| Craig | E. F. Irwin | 63 | 2 | 35.3 | 0.27 | 1.1 | 6 | 77 | 14 | 10 | 7 | S |
| Creighton | Dr. Geo. Roberts | 57 | 0 | 31.1 | 0.33 | 0.5 | 1 | ...... | ...... | ...... | ...... | NW |
| De Soto | Chas. Seltz | 67 | 6 | 37.1 | 0.07 | 0.1 | 2 | ...... | 12 | 12 | 7 | S |
| Fort Omaha | ...... | 70 | 5 | 37.0 | T | 0 | 0 | ...... | ...... | ...... | ...... | ...... |
| *Fremont | I. E. Heaton | 66 | 9 | 37.3 | 0.11 | 0 | 0 | ...... | ...... | ...... | ...... | ...... |
| Oakdale | G. S. Clingman | 59 | 0 | 32.0 | 0.60 | 2.0 | 3 | ...... | 11 | 12 | 8 | S |
| *Omaha | Observer S. S. | 68 | 10 | 39.4 | 0.50 | ...... | 5 | 70 | 14 | 10 | 7 | S |
| Sioux City, Iowa | Observer S. S. | 62 | 5 | 35.2 | 1.14 | ...... | 6 | ...... | 13 | 11 | 7 | S |
| Stuart | C. E. Barber | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| West Point | E. G. Bruner | 65 | ...... | ...... | 0.75 | 1.0 | 2 | ...... | ...... | ...... | ...... | S |
| *Yankton, Dakota | Observer S. S. | 60 | 3 | 34.4 | 1.37 | ...... | 4 | 79 | 14 | 10 | 7 | S |
| Mean for section.* | ...... | ...... | ...... | 35.4 | 0.51 | 0.7 | 2.9 | ...... | 13.0 | 10.8 | 7.1 | ...... |
| Mean for East Neb. | ...... | ...... | ...... | 36.1 | 0.32 | 0.5 | 2.0 | ...... | 11.4 | 9.9 | 9.2 | ...... |
| LOWER LOUP. | | | | | | | | | | | | |
| Genoa | G. S. Truman | 64 | 7 | 35.4 | 0.44 | 2.0 | 2 | ...... | 11 | 10 | 10 | W |
| Grand Island | T. A. Watson | ...... | 1 | 34.0 | 0.20 | ...... | 2 | ...... | 8 | 3 | 12 | SW |
| North Loup | E. W. Black | 62 | 0 | 35.1 | 0.35 | 0 | 1 | ...... | ...... | ...... | ...... | ...... |
| Palmer | C. Shieldstream | 60 | 10 | 35.6 | 0.20 | 1.0 | 2 | ...... | ...... | ...... | ...... | S |
| *Ravenna | E. Smith | 64 | 4 | 36.4 | 0.25 | T | 1 | ...... | 5 | 14 | 12 | NW |
| West Hill | J. L. Truman | 62 | 5 | 35.3 | 0.82 | 2.0 | 2 | ...... | 8 | 11 | 12 | SW |
| UPPER LOUP | | | | | | | | | | | | |
| Alliance | T. D. Shurtz | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Ansley | Peter Fowlie | 70 | -1 | 34.2 | T | T | 0 | ...... | ...... | ...... | ...... | N |
| Bingham | W. C. Wood | 62 | 3 | 32.1 | 0.17 | 1.0 | 1 | ...... | ...... | ...... | ...... | ...... |
| Mullen | F. L. Mary | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Sargent | J. S. Spooner | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Mean for Loup section, | ...... | ...... | ...... | 34.8 | 0.30 | 0.8 | 1.4 | ...... | 8.0 | 9.5 | 11.5 | ...... |
| NIOBBARA. | | | | | | | | | | | | |
| Fort Niobrara | ...... | 63 | -14 | 31.8 | 0.72 | 4.9 | 3 | ...... | ...... | ...... | ...... | W |
| Fort Robinson | Hospital Steward | 66 | -1 | 38.0 | 0.78 | 8.0 | 1 | ...... | ...... | ...... | ...... | NW |
| Kennedy | Mrs. Erickson | 71 | 6 | 39.1 | 0.51 | 7.0 | 2 | ...... | 0 | 11 | 20 | NW |
| *Hay Springs | Wm. Waterman | 64 | -3 | 31.9 | 0.67 | 3.7 | 2 | ...... | 2 | 14 | 15 | SW |
| *Valentine | Observer S. S. | 66 | -5 | 35.6 | 0.84 | ...... | 4 | 59 | 7 | 11 | 13 | W |
| REPUBLICAN. | | | | | | | | | | | | |
| Culbertson | John Bailor | ...... | ...... | ...... | 0.11 | ...... | 2 | ...... | ...... | ...... | ...... | ...... |
| Franklin | W. A. Harshbarger | 68 | -3 | 33.1 | 0.03 | ...... | 1 | ...... | 18 | 0 | 12 | S |
| UPPER PLATTE. | | | | | | | | | | | | |
| Fort Sidney | ...... | 66 | -5 | 36.1 | 1.15 | 6.5 | 3 | ...... | ...... | ...... | ...... | NW |
| Gering | J. P. Finley | 66 | 1 | 37.9 | 0.45 | 2.5 | 2 | ...... | ...... | ...... | ...... | SW |
| Grant | G. W. Talbot | ...... | 10 | ...... | T | ...... | 0 | ...... | 3 | 0 | 28 | ...... |
| *Kimball | D. Henderson | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Lexington | J. M. Tipton | 63 | 10 | 30.7 | 0.09 | 0.5 | 2 | ...... | 7 | 9 | 15 | NW |
| *North Platte | Observer S. S. | 70 | 6 | 37.0 | 0.54 | ...... | 2 | ...... | 2 | 21 | 8 | W |
| Mean for West Neb | ...... | ...... | ...... | 35.1 | 0.50 | 4.7 | 2.0 | ...... | 5.6 | 9.4 | 15.9 | ...... |
| Mean for state | ...... | ...... | ...... | 35.8 | 0.36 | 1.6 | 1.8 | 72.6 | 9.1 | 9.7 | 11.4 | S |

* Maximum and minimum temperature from self-registering thermometer. T in precipitation column indicates trace.

# UNITED STATES SIGNAL SERVICE.

Following are the monthly meteorological summaries for the year 1889, furnished by Sergt. L. A. Wells, signal corps observer:

## JANUARY.

| Date. | TEMPERATURE. | | | Precip. in inches & 100ths |
|---|---|---|---|---|
| | Mean. | Max. | Min. | |
| 1 | 27.0 | 42.7 | 16.4 | ............ |
| 2 | 27.0 | 40.6 | 20.6 | ............ |
| 3 | 28.0 | 41.5 | 19.7 | ............ |
| 4 | 30.5 | 40.0 | 23.0 | ............ |
| 5 | 26.5 | 27.2 | 23.5 | ............ |
| 6 | 27.0 | 31.2 | 23.2 | ............ |
| 7 | 29.5 | 38.4 | 23.0 | ............ |
| 8 | 31.0 | 33.8 | 28.5 | .02 |
| 9 | 20.5 | 24.0 | 17.0 | ............ |
| 10 | 17.0 | 22.2 | 14.2 | ............ |
| 11 | 18.5 | 27.2 | 9.0 | ............ |
| 12 | 20.5 | 26.0 | 18.6 | T |
| 13 | 18.0 | 21.0 | 15.2 | ............ |
| 14 | 26.5 | 30.5 | 19.4 | .18 |
| 15 | 37.0 | 40.1 | 29.0 | .78 |
| 16 | 30.0 | 44.4 | 21.5 | .26 |
| 17 | 21.0 | 29.8 | 16.7 | ............ |
| 18 | 13.5 | 24.3 | 4.3 | ............ |
| 19 | 21.0 | 25.7 | 18.9 | .31 |
| 20 | 5.0 | 15.8 | -2.5 | ............ |
| 21 | 19.5 | 34.8 | 6.8 | ............ |
| 22 | 22.0 | 39.0 | 11.2 | ............ |
| 23 | 24.5 | 34.3 | 18.0 | ............ |
| 24 | 26.0 | 41.6 | 13.3 | ............ |
| 25 | 29.5 | 47.0 | 24.5 | ............ |
| 26 | 3.5 | 9.0 | -1.2 | .02 |
| 27 | 11.0 | 15.4 | 5.2 | .05 |
| 28 | 18.5 | 27.7 | -0.4 | ............ |
| 29 | 27.5 | 41.5 | 18.5 | ............ |
| 30 | 32.0 | 46.0 | 27.0 | ............ |
| 31 | 15.5 | 24.7 | 8.2 | ............ |

NOTE.—Barometer reduced to sea level. "T" indicates trace of rainfall.

### SUMMARY.

Mean barometer, 30.124. Highest barometer, 30.44; date, 26th. Lowest barometer, 29.29; date, 16th. Mean temperature, 22.8. Highest temperature, 47.0; date, 25th. Lowest temperature, -2.5; date, 20th. Greatest daily range of temperature, 38.1, 28th. Least daily range of temperature, 3.7, 5th. Mean of monthly maximum and minimum temperature, 24.0.

*Mean temperature for this month in—*

| | | | | | |
|---|---|---|---|---|---|
| 1871 | 24.0 | 1878 | 28.8 | 1884 | 17.0 |
| 1872 | 19.2 | 1879 | 21.7 | 1885 | 12.2 |
| 1873 | 16.9 | 1880 | 34.5 | 1886 | 7.3 |
| 1874 | 22.2 | 1881 | 11.8 | 1887 | 11.8 |
| 1875 | 10.8 | 1882 | 27.5 | 1888 | 8.0 |
| 1876 | 26.7 | 1883 | 11.9 | 1889 | 22.8 |
| 1877 | 20.2 | | | | |

Total excess in temperature during month, 70°. Total excess in temperature since January 1, 70°. Prevailing direction of wind, northwest. Total movement of wind, 6,205 miles. Extreme velocity of wind, direction and date, 40, 25th, 27th, 31st. Total precipitation, 1.62 inches. Number of days on which .01 inch or more of precipitation fell, 7.

*Total Precipitation (in inches and hundredths) for this month in—*

| | | | | | |
|---|---|---|---|---|---|
| 1871 | 0.60 | 1877 | 0.53 | 1883 | 1.01 |
| 1872 | 0.08 | 1878 | 1.18 | 1884 | 0.73 |
| 1873 | 0.64 | 1879 | 0 07 | 1885 | 0.41 |
| 1874 | 0.32 | 1880 | 0.90 | 1886 | 1.15 |
| 1875 | 0.26 | 1881 | 0.61 | 1887 | 0.49 |
| 1876 | 0.22 | 1882 | 0.74 | 1888 | 0.58 |

Total excess in precipitation during month, 1.03. Total excess in precipitation since January 1st, 1.03. Number of cloudless days, 12. Partly cloudy days, 7. Cloudy days, 12. Date of frosts, ——

## FEBRUARY.

| Date. | TEMPERATURE. | | | Precip in inches & 100ths |
|---|---|---|---|---|
| | Mean. | Max. | Min. | |
| 1 | 29.5 | 47 | 19 | ............ |
| 2 | 36.0 | 52 | 25 | ............ |
| 3 | 36.0 | 44 | 35 | ............ |
| 4 | 30.5 | 48 | 16 | T |
| 5 | 1.5 | 7 | -3 | .01 |
| 6 | 2.0 | 14 | -9 | ............ |
| 7 | 27.0 | 46 | 12 | ............ |
| 8 | 28.0 | 32 | 25 | T |
| 9 | 28.0 | 45 | 16 | ............ |
| 10 | 30.0 | 40 | 28 | ............ |
| 11 | 18.5 | 28 | 12 | T |
| 12 | 28.5 | 37 | 19 | ............ |
| 13 | 42.5 | 50 | 29 | ............ |
| 14 | 37.0 | 43 | 33 | T |
| 15 | 36.0 | 53 | 35 | T |
| 16 | 20.0 | 24 | 18 | .21 |
| 17 | 5.0 | 10 | 2 | .01 |
| 18 | 5.0 | 16 | -2 | ............ |
| 19 | 4.0 | 16 | -4 | ............ |
| 20 | 13.0 | 27 | 2 | ............ |
| 21 | 16.0 | 46 | 8 | T |
| 22 | -4.0 | 3 | -8 | T |
| 23 | -3.5 | 2 | -10 | ............ |
| 24 | 8.0 | 18 | -2 | ............ |
| 25 | 16.5 | 25 | 10 | T |
| 26 | 28.0 | 42 | 20 | T |
| 27 | 34.5 | 52 | 21 | ............ |
| 28 | 37.0 | 47 | 32 | ............ |

NOTE.—Barometer reduced to sea level. "T" indicates trace of rainfall.

### SUMMARY.

Mean barometer, 30.232. Highest barometer, 31.04, date 23d. Lowest barometer, date 4th. Mean temperature, 21.1. Highest temperature, 53, 15. Lowest temperature, -10, date, 23d. Greatest daily range of temperature, 38, 21st. Least daily range of temperature, 6, 16th. Monthly mean humidity, 73.6. Mean dew point, 13.6.

*Mean temperature for this month in—*

| | | | | | |
|---|---|---|---|---|---|
| 1871 | 30.3 | 1878 | 36.7 | 1884 | 19.4 |
| 1872 | 27.5 | 1879 | 26.8 | 1885 | 16.6 |
| 1873 | 26.7 | 1880 | 30.9 | 1886 | 24.4 |
| 1874 | 23.0 | 1881 | 17.9 | 1887 | 18.2 |
| 1875 | 13.4 | 1882 | 36.3 | 1888 | 25.9 |
| 1876 | 30.4 | 1883 | 21.7 | 1889 | 21.1 |
| 1877 | 37.3 | | | | |

Total deficiency in temperature during month, 149°. Total deficiency in temperature since January 1st, 77°. Prevailing direction of wind, northwest. Total movement of wind, 6,776 miles. Extreme velocity of wind, direction, and date, 60, northwest, 4th. Total precipitation, 0.23 inches. Number of days on which .01 inch or more of precipitation fell, 3.

*Total precipitation (in inches and hundredths) for this month in—*

| | | | | | |
|---|---|---|---|---|---|
| 1871 | 1.76 | 1878 | 0.14 | 1884 | 1.42 |
| 1872 | 0.43 | 1879 | 0.94 | 1885 | 0.47 |
| 1873 | 0.04 | 1880 | 0.14 | 1886 | 0.36 |
| 1874 | 0.92 | 1881 | 3.09 | 1887 | 1.00 |
| 1875 | 0.51 | 1882 | 0.60 | 1888 | 0.74 |
| 1876 | 0.40 | 1883 | 1.09 | 1889 | 0.23 |
| 1877 | 0.44 | | | | |

Total deficiency in precipitation during month, 0.55. Total excess in precipitation since January 1st, 0.48. Number cloudless days, 6. Partly cloudy days, 10. Cloudy days, 12.

## MARCH.

| Date. | TEMPERATURE. | | | Precip. in inches & 100ths |
|---|---|---|---|---|
| | Mean. | Max. | Min. | |
| 1 | 36.5 | 48 | 30 | .......... |
| 2 | 40.0 | 56 | 31 | .......... |
| 3 | 39.5 | 61 | 31 | .......... |
| 4 | 35.0 | 46 | 29 | .......... |
| 5 | 39.5 | 61 | 26 | .......... |
| 6 | 42.5 | 63 | 32 | .......... |
| 7 | 35.5 | 46 | 30 | .......... |
| 8 | 25.0 | 30 | 20 | .01 |
| 9 | 25.5 | 40 | 17 | .......... |
| 10 | 30.5 | 48 | 19 | .......... |
| 11 | 43.5 | 60 | 31 | .......... |
| 12 | 38.5 | 52 | 28 | .......... |
| 13 | 47.5 | 60 | 37 | .......... |
| 14 | 42.5 | 66 | 34 | .......... |
| 15 | 28.5 | 29 | 26 | .20 |
| 16 | 35.5 | 45 | 28 | .......... |
| 17 | 38.5 | 48 | 32 | .24 |
| 18 | 42.5 | 51 | 38 | .08 |
| 19 | 44.0 | 63 | 29 | .......... |
| 20 | 47.5 | 60 | 40 | .......... |
| 21 | 49.5 | 60 | 43 | .......... |
| 22 | 45.5 | 60 | 34 | .......... |
| 23 | 45.5 | 63 | 32 | .......... |
| 24 | 48.0 | 65 | 34 | .......... |
| 25 | 52.0 | 71 | 37 | .......... |
| 26 | 47.5 | 67 | 36 | .......... |
| 27 | 37.5 | 53 | 30 | .......... |
| 28 | 48.0 | 62 | 26 | .......... |
| 29 | 34.5 | 48 | 29 | .......... |
| 30 | 39.0 | 48 | 30 | .......... |
| 31 | 45.5 | 60 | 35 | .......... |

NOTE.—Barometer reduced to sea level. "T" indicates trace of rainfall.

### SUMMARY.

Mean barometer, 30.099. Highest barometer, 30.50; date, 10th. Lowest barometer, 29.58; date, 14th. Mean temperature, 40.2. Highest temperature, 71; date, 25th. Lowest temperature, 17; date, 9th. Greatest daily range of temperature, 36, 28th. Least daily range of temperature, 3, 15th. Mean of monthly maximum and minimum temperature, 43.5.

*Mean temperature for this month in—*

| | | | | | |
|---|---|---|---|---|---|
| 1871 | 40.8 | 1878 | 47.9 | 1884 | 35.3 |
| 1872 | 31.2 | 1879 | 41.0 | 1885 | 36.1 |
| 1873 | 38.1 | 1880 | 35.9 | 1886 | 31.9 |
| 1874 | 33.5 | 1881 | 27.6 | 1887 | 38.0 |
| 1875 | 30.2 | 1882 | 40.2 | 1888 | 28.8 |
| 1876 | 29.2 | 1883 | 34.6 | 1889 | 40.2 |
| 1877 | 33.6 | | | | |

Total excess in temperature during month, 218°. Total excess in temperature since January 1st, 237°. Prevailing direction of wind, north. Total movement of wind, 6,050 miles. Extreme velocity of wind, direction, and date, 34, north. Total precipitation, 0.53 inches. Number of days on which .01 inch or more of precipitation fell, 4.

*Total precipitation (in inches and hundredths) for this month in—*

| | | | | | |
|---|---|---|---|---|---|
| 1871 | 0.18 | 1877 | 1.26 | 1883 | 0.52 |
| 1872 | 1.61 | 1878 | 3.09 | 1884 | 4.91 |
| 1873 | 0.44 | 1879 | 2.17 | 1886 | 0.33 |
| 1874 | 1.49 | 1880 | 0.50 | 1886 | 1.31 |
| 1875 | 1.24 | 1881 | 0.72 | 1887 | 0.48 |
| 1876 | 3.18 | 1882 | 0.79 | 1888 | 3.25 |

Total deficiency in precipitation during month, 0.96. Total deficiency in precipitation since January 1st, 0.48. Number of cloudless days, 9. Partly cloudy days, 14. Cloudy days, 8.

## APRIL.

| Date. | TEMPERATURE. | | | Precip. in inches & 100ths |
|---|---|---|---|---|
| | Mean. | Max. | Min. | |
| 1 | 53.0 | 78 | 39 | .......... |
| 2 | 58.5 | 80 | 45 | .......... |
| 3 | 40.5 | 52 | 32 | .......... |
| 4 | 50.0 | 72 | 33 | .......... |
| 5 | 44.5 | 59 | 35 | .......... |
| 6 | 45.5 | 54 | 36 | .......... |
| 7 | 53.0 | 67 | 41 | .02 |
| 8 | 49.0 | 56 | 47 | .06 |
| 9 | 52.5 | 59 | 47 | .01 |
| 10 | 51.0 | 60 | 44 | .20 |
| 11 | 57.5 | 72 | 52 | .29 |
| 12 | 47.5 | 54 | 43 | .01 |
| 13 | 46.0 | 51 | 42 | .......... |
| 14 | 49.0 | 60 | 42 | .......... |
| 15 | 51.0 | 66 | 38 | .......... |
| 16 | 54.5 | 69 | 48 | .01 |
| 17 | 53.0 | 60 | 47 | .32 |
| 18 | 53.5 | 61 | 48 | .18 |
| 19 | 56.0 | 71 | 42 | .......... |
| 20 | 64.0 | 80 | 51 | .......... |
| 21 | 53.0 | 66 | 42 | .......... |
| 22 | 61.5 | 77 | 47 | .......... |
| 23 | 60.0 | 75 | 58 | .......... |
| 24 | 54.5 | 66 | 47 | .......... |
| 25 | 60.5 | 78 | 42 | .......... |
| 26 | 61.0 | 72 | 55 | .09 |
| 27 | 52.5 | 64 | 44 | .......... |
| 28 | 47.0 | 58 | 38 | .......... |
| 29 | 44.5 | 51 | 39 | .......... |
| 30 | 47.0 | 60 | 34 | .......... |

NOTE.—Barometer reduced to sea level. "T" indicates trace of rainfall.

### SUMMARY.

Mean barometer, 30.046. Highest barometer, 30.52; date, 21st. Lowest barometer, 29.42; date, 11th. Mean temperature, 52.4. Highest temperature, 80; date, 2d and 20th. Lowest temperature, 32; date, 3d. Greatest daily range of temperature, 39, on the 4th. Least daily range of temperature, 9, on the 8th and 13th.

*Mean temperature for this month in—*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1871 | 53.7 | 1876 | 51.1 | 1881 | 44.4 | 1886 | 50.9 |
| 1872 | 50.8 | 1877 | 50.1 | 1882 | 52.0 | 1887 | 54.5 |
| 1873 | 45.3 | 1878 | 54.6 | 1883 | 53.6 | 1888 | 52.5 |
| 1874 | 44.7 | 1879 | 53.6 | 1884 | 47.5 | 1889 | 52.4 |
| 1875 | 44.9 | 1880 | 51.2 | 1885 | 50.1 | | |

Total excess in temperature during month, 129°. Total excess in temperature since January 1st, 366°. Prevailing direction of wind, north and southeast. Total movement of the wind, 6,856 miles. Extreme velocity of wind, direction, and date, 45 miles, northwest, on the 2d. Total precipitation, 1.19 inches. Number of days on which .01 inch or more of precipitation fell, 10.

*Total precipitation (in inches and hundredths) for this month in—*

| | | | | | |
|---|---|---|---|---|---|
| 1871 | 3.38 | 1877 | 6.24 | 1883 | 3.20 |
| 1872 | 3.84 | 1878 | 3.97 | 1884 | 3.88 |
| 1873 | 3.82 | 1879 | 1.77 | 1885 | 6.34 |
| 1874 | 2.01 | 1880 | 0.55 | 1886 | 1.77 |
| 1875 | 3.06 | 1881 | 4.23 | 1887 | 0.88 |
| 1876 | 2.65 | 1882 | 4.31 | 1888 | 2.95 |

Total deficiency in precipitation during month, 2.26. Total deficiency in precipitation since January 1st, 2.74. Number of cloudless days, 7. Partly cloudy days, 10. Cloudy days, 13. Dates of frosts,——

## MAY.

| Date. | TEMPERATURE. Mean. | TEMPERATURE. Max. | TEMPERATURE. Min. | Precip. in inches & 100ths |
|---|---|---|---|---|
| 1 | 48.5 | 60 | 37 | ........... |
| 2 | 50.0 | 63 | 37 | ........... |
| 3 | 56.5 | 70 | 42 | ........... |
| 4 | 60.5 | 75 | 45 | ........... |
| 5 | 70.5 | 85 | 60 | ........... |
| 6 | 73.0 | 90 | 66 | ........... |
| 7 | 69.5 | 81 | 59 | .24 |
| 8 | 75.5 | 87 | 69 | .05 |
| 9 | 70.0 | 83 | 63 | .43 |
| 10 | 60.5 | 66 | 56 | .11 |
| 11 | 58.5 | 69 | 53 | .01 |
| 12 | 60.5 | 68 | 54 | ........... |
| 13 | 65.0 | 77 | 51 | ........... |
| 14 | 67.0 | 81 | 56 | .14 |
| 15 | 63.5 | 69 | 57 | .98 |
| 16 | 65.0 | 75 | 58 | .22 |
| 17 | 48.0 | 52 | 45 | .29 |
| 18 | 57.5 | 70 | 48 | ........... |
| 19 | 61.0 | 76 | 50 | T |
| 20 | 61.0 | 72 | 53 | ........... |
| 21 | 64.5 | 76 | 50 | ........... |
| 22 | 62.0 | 74 | 52 | ........... |
| 23 | 71.0 | 82 | 61 | ........... |
| 24 | 63.0 | 72 | 58 | ........... |
| 25 | 62.5 | 72 | 54 | ........... |
| 26 | 62.0 | 70 | 57 | .10 |
| 27 | 62.5 | 74 | 51 | ........... |
| 28 | 55.5 | 59 | 52 | .10 |
| 29 | 53.0 | 65 | 46 | ........... |
| 30 | 56.0 | 67 | 46 | ........... |
| 31 | 57.5 | 68 | 42 | ........... |

NOTE.—Barometer reduced to sea level. "T" indicates trace of rainfall.

### SUMMARY.

Mean barometer, 29.944. Highest barometer, 30.45; date, 2d. Lowest barometer, 29.39; date, 6th. Mean temperature, 61.6. Highest temperature, 9; date, 6th. Lowest temperature, 37; date, 1st and 2d. Greatest daily range of temperature, 30. Least daily range of temperature, 7.

*Mean temperature for this month in—*

| | | | | | |
|---|---|---|---|---|---|
| 1871 | 63.4 | 1878 | 58.1 | 1884 | 61.6 |
| 1872 | 60.9 | 1879 | 66.8 | 1885 | 59.8 |
| 1873 | 58.8 | 1880 | 69.4 | 1886 | 65.1 |
| 1874 | 66.1 | 1881 | 67.8 | 1887 | 66.1 |
| 1875 | 62.9 | 1882 | 56.6 | 1888 | 55.9 |
| 1876 | 63.0 | 1883 | 57.3 | 1889 | 61.6 |
| 1877 | 60.3 | | | | |

Total excess in temperature during month, 6°. Total excess in temperature since January 1st, 372°. Prevailing direction of wind, north. Total movement of wind, 7,409 miles. Extreme velocity of wind, direction, and date, 46 miles, south, on 6th. Total precipitation, 2.67 inches. Number of days on which .01 inch or more of precipitation fell, 11.

*Total precipitation (in inches and hundredths) for this month in—*

| | | | | | |
|---|---|---|---|---|---|
| 1871 | 1.83 | 1877 | 8.62 | 1883 | 11.29 |
| 1872 | 6.35 | 1878 | 5.77 | 1884 | 1.45 |
| 1873 | 5.59 | 1879 | 5.53 | 1885 | 4.43 |
| 1874 | 1.24 | 1880 | 3.40 | 1886 | 4.58 |
| 1875 | 4.25 | 1881 | 7.94 | 1887 | 1.39 |
| 1876 | 2.07 | 1882 | 4.91 | 1888 | 4.36 |

Total deficiency in precipitation during month, 2.29 inches. Total deficiency in precipitation since January 1st, 5.03 inches. Number of cloudless days, 9. Partly cloudy days, 12. Cloudy days, 10.

## JUNE.

| Date. | TEMPERATURE. Mean. | TEMPERATURE. Max. | TEMPERATURE. Min. | Precip. in inches & 100ths |
|---|---|---|---|---|
| 1 | 57.0 | 72 | 44 | ........... |
| 2 | 61.0 | 76 | 46 | .11 |
| 3 | 65.0 | 76 | 53 | ........... |
| 4 | 65.0 | 76 | 54 | ........... |
| 5 | 68.0 | 81 | 52 | ........... |
| 6 | 75.5 | 88 | 61 | ........... |
| 7 | 70.5 | 81 | 65 | .52 |
| 8 | 61.0 | 70 | 57 | 2.02 |
| 9 | 59.0 | 67 | 51 | ........... |
| 10 | 60.0 | 70 | 54 | .08 |
| 11 | 65.5 | 78 | 52 | ........... |
| 12 | 72.0 | 85 | 60 | ........... |
| 13 | 73.0 | 86 | 61 | ........... |
| 14 | 74.0 | 88 | 62 | ........... |
| 15 | 63.0 | 80 | 62 | .88 |
| 16 | 70.0 | 80 | 62 | ........... |
| 17 | 75.0 | 83 | 64 | ........... |
| 18 | 78.0 | 90 | 67 | ........... |
| 19 | 76.0 | 86 | 66 | ........... |
| 20 | 65.5 | 70 | 62 | .85 |
| 21 | 63.5 | 74 | 54 | ........... |
| 22 | 64.0 | 74 | 55 | ........... |
| 23 | 67.0 | 78 | 57 | ........... |
| 24 | 62.0 | 70 | 58 | .53 |
| 25 | 71.0 | 81 | 60 | .45 |
| 26 | 71.5 | 84 | 61 | ........... |
| 27 | 74.0 | 86 | 63 | ........... |
| 28 | 77.5 | 89 | 69 | ........... |
| 29 | 78.5 | 88 | 70 | ........... |
| 30 | 78.5 | 89 | 70 | ........... |

NOTE.—Barometer reduced to sea level. "T" indicates trace of rainfall.

### SUMMARY.

Mean barometer, 29.983. Highest barometer, 30.38; date, 22d. Lowest barometer, 29.59; date, 7th. Mean temperature, 68.7. Highest temperature, 90.5; date, 18th. Lowest temperature, 44; date, 1st. Greatest daily range of temperature, 30°, on the 2d. Least daily range of temperature, 8°, on the 20th.

*Mean temperature for this month in —*

| | | | | | |
|---|---|---|---|---|---|
| 1871 | 75.8 | 1878 | 66.7 | 1884 | 72.3 |
| 1872 | 72.8 | 1879 | 72.7 | 1885 | 71.1 |
| 1873 | 74.1 | 1880 | 73.0 | 1886 | 72.0 |
| 1874 | 73.1 | 1881 | 74.9 | 1887 | 72.4 |
| 1875 | 70.9 | 1882 | 71.0 | 1888 | 70.0 |
| 1876 | 68.2 | 1883 | 69.1 | 1889 | 68.7 |
| 1877 | 69.1 | | | | |

Total deficiency in temperature during month, 70°. Total excess in temperature since January 1st, 302°. Prevailing direction of wind, south. Total movement of wind, 4,990 miles. Extreme velocity of wind, direction and date, 40, on the 8th. Total precipitation, 5.44 inches. Number of days on which .01 inch or more of precipitation fell, 8.

*Total precipitation (in inches and hundredths) for this month in —*

| | | | | | |
|---|---|---|---|---|---|
| 1871 | 2.66 | 1877 | 8.36 | 1883 | 12.70 |
| 1872 | 3.91 | 1878 | 8.48 | 1884 | 6.11 |
| 1873 | 5.86 | 1879 | 4.09 | 1885 | 2.67 |
| 1874 | 6.93 | 1880 | 3.14 | 1886 | 1.50 |
| 1875 | 10.95 | 1881 | 5.56 | 1887 | 4.56 |
| 1876 | 3.47 | 1882 | 12.05 | 1888 | 3.86 |

Total deficiency in precipitation during month, .71. Total deficiency in precipitation since January 1st, 5.74. Number of cloudless days, 13. Partly cloudy days, 12. Cloudy days, 5. Dates of frost, none.

## JULY.

| Date. | TEMPERATURE. | | | Precip. in inches & 100ths |
|---|---|---|---|---|
| | Mean. | Max. | Min. | |
| 1 | 81 | 89 | 73 | ........... |
| 2 | 76 | 84 | 67 | .04 |
| 3 | 70 | 83 | 56 | ........... |
| 4 | 74 | 85 | 57 | ........... |
| 5 | 74 | 86 | 62 | ........... |
| 6 | 82 | 94 | 70 | ........... |
| 7 | 84 | 94 | 75 | ........... |
| 8 | 78 | 86 | 69 | 1.87 |
| 9 | 76 | 83 | 68 | .06 |
| 10 | 76 | 84 | 68 | T |
| 11 | 77 | 87 | 67 | ........... |
| 12 | 76 | 85 | 68 | .13 |
| 13 | 80 | 89 | 72 | .78 |
| 14 | 72 | 79 | 66 | .48 |
| 15 | 68 | 72 | 64 | .08 |
| 16 | 72 | 80 | 65 | .63 |
| 17 | 83 | 93 | 73 | ........... |
| 18 | 80 | 91 | 70 | .15 |
| 19 | 76 | 84 | 67 | ........... |
| 20 | 75 | 82 | 68 | ........... |
| 21 | 78 | 89 | 68 | ........... |
| 22 | 74 | 81 | 67 | .33 |
| 23 | 65 | 72 | 58 | .31 |
| 24 | 68 | 80 | 57 | ........... |
| 25 | 74 | 80 | 68 | .08 |
| 26 | 77 | 89 | 65 | ........... |
| 27 | 80 | 89 | 71 | ........... |
| 28 | 69 | 77 | 61 | ........... |
| 29 | 70 | 78 | 61 | ........... |
| 30 | 67 | 78 | 56 | ........... |
| 31 | 70 | 80 | 59 | ........... |

NOTE.—Barometer reduced to sea level. "T" indicates trace of rainfall.

### SUMMARY.

Mean barometer, 29.968. Highest barometer, 30.234; date, 30th. Lowest barometer, 29.713; date, 17th. Mean temperature, 74.8. Highest temperature, 94; date, 6th and 7th. Lowest temperature, 56; date, 3d and 30th. Greatest daily range of temperature, 28°, 4th. Least daily range of temperature, 8°, 15th.

*Mean temperature for this month in —*

| | | | | | |
|---|---|---|---|---|---|
| 1871 | 75.4 | 1877 | 75.6 | 1883 | 75.7 |
| 1872 | 76.1 | 1878 | 79.0 | 1884 | 74.5 |
| 1873 | 74.5 | 1879 | 78.5 | 1885 | 77.0 |
| 1874 | 79.6 | 1880 | 76.7 | 1886 | 77.3 |
| 1875 | 74.2 | 1881 | 78.9 | 1887 | 76.3 |
| 1876 | 75.2 | 1882 | 71.7 | 1888 | 77.6 |

Total deficiency in temperature during month, 38°. Total excess of temperature since January 1st, 264°. Prevailing direction of wind, south. Total movement of wind, 5,328 miles. Extreme velocity of wind, direction and date, 40, northwest, on the 13th. Total precipitation, 4.94 inches. Number of days on which .01 inch or more of precipitation fell, 12.

*Total precipitation (in inches and hundredths) for this month in*

| | | | | | |
|---|---|---|---|---|---|
| 1871 | 9.89 | 1877 | 0.96 | 1883 | 4.79 |
| 1872 | 6.36 | 1878 | 7.66 | 1884 | 10.35 |
| 1873 | 4.24 | 1879 | 3.17 | 1885 | 9.24 |
| 1874 | 0.54 | 1880 | 5.36 | 1886 | 0.69 |
| 1875 | 10.01 | 1881 | 5.89 | 1887 | 2.02 |
| 1876 | 7.30 | 1882 | 6.76 | 1888 | 2.56 |

Total deficiency in precipitation during month, 0.89. Total deficiency in precipitation since January 1st, 6.63. No. of cloudless days, 9. Partly cloudy days, 12. Cloudy days, 10. Dates of frost, none.

## AUGUST.

| Date. | TEMPERATURE. | | | Precip. in inches & 100ths |
|---|---|---|---|---|
| | Mean. | Max. | Min. | |
| 1 | 74 | 81.7 | 65.0 | ........... |
| 2 | 71 | 82.5 | 59.9 | ........... |
| 3 | 74 | 84.7 | 62.5 | ........... |
| 4 | 70 | 79.5 | 60.0 | ........... |
| 5 | 69 | 78.4 | 59.5 | ........... |
| 6 | 68 | 77.6 | 57.2 | .68 |
| 7 | 76 | 82.3 | 68.6 | .02 |
| 8 | 78 | 85.2 | 72.0 | .47 |
| 9 | 74 | 80.2 | 68.0 | 1.15 |
| 10 | 69 | 77.7 | 60.0 | ........... |
| 11 | 69 | 77.5 | 60.0 | ........... |
| 12 | 68 | 73.5 | 62.6 | .33 |
| 13 | 76 | 87.0 | 66.4 | T |
| 14 | 68 | 76.9 | 58.8 | ........... |
| 15 | 70 | 80.0 | 60.6 | ........... |
| 16 | 72 | 82.8 | 61.2 | ........... |
| 17 | 75 | 84.5 | 66.2 | ........... |
| 18 | 78 | 87.0 | 63.2 | ........... |
| 19 | 81 | 90.0 | 71.8 | ........... |
| 20 | 74 | 78.2 | 70.2 | .13 |
| 21 | 69 | 82.4 | 56.0 | ........... |
| 22 | 73 | 84.8 | 60.6 | ........... |
| 23 | 74 | 84.6 | 63.9 | ........... |
| 24 | 76 | 87.0 | 64.5 | ........... |
| 25 | 78 | 87.5 | 67.6 | ........... |
| 26 | 74 | 84.4 | 64.8 | .12 |
| 27 | 78 | 89.2 | 67.0 | ........... |
| 28 | 78 | 90.6 | 66.4 | ........... |
| 29 | 80 | 91.9 | 66.6 | ........... |
| 30 | 80 | 91.0 | 68.0 | ........... |
| 31 | 78 | 89.0 | 67.0 | ........... |

NOTE.—Barometer reduced to sea level. "T" indicates trace of rainfall.

### SUMMARY

Mean barometer, 30.036; highest barometer, 30.285; date 5th; lowest barometer, 29.821; date, 19th, Mean temperature, 74.0. Highest temperature, 91.9; date, 29th. Lowest temperature, 56; date, 21st. Greatest daily range of temparature, 26. Least daily range of temperature, 8.

*Mean temperature for this month in —*

| | | | | | |
|---|---|---|---|---|---|
| 1871 | 73.5 | 1878 | 76.8 | 1884 | 70.3 |
| 1872 | 74.9 | 1879 | 75.0 | 1885 | 69.9 |
| 1873 | 77.2 | 1880 | 74.7 | 1886 | 75.6 |
| 1874 | 77.1 | 1881 | 80.2 | 1887 | 72.0 |
| 1875 | 70.0 | 1882 | 73.1 | 1888 | 70.3 |
| 1876 | 74.9 | 1883 | 71.3 | 1889 | 74.0 |
| 1877 | 72.6 | | | | |

Total excess or deficiency in temperature during month, none. Total excess in temperature since January 1, 261°. Prevailing direction of wind, south. Total movement of wind, 5,201 miles. Extreme velocity of wind, direction, and date, 32 miles, 6th. Total precipitation, 2.90 inches. Number of days on which .01 inch or more of precipitation fell, 7.

*Total precipitation (in inches and hundredths) for this month in —*

| | | | | | |
|---|---|---|---|---|---|
| 1871 | 2.58 | 1877 | 3.13 | 1883 | 3.29 |
| 1872 | 1.78 | 1878 | 2.48 | 1884 | 7.07 |
| 1873 | 1.60 | 1879 | 1.51 | 1885 | 4.53 |
| 1874 | 2.08 | 1880 | 7.10 | 1886 | 2.53 |
| 1875 | 7.77 | 1881 | 1.65 | 1887 | 3.94 |
| 1876 | 6.27 | 1882 | 0.95 | 1888 | 3.44 |

Total deficiency in precipitation during month, 0.63. Total deficiency in precipitation since January 1, 7.26. Number of cloudless days, 14; partly cloudy days, 12; cloudy days, 5. Mean dew point, 61.9. Mean relative humidity, 73.2.

## SEPTEMBER.

| Date. | TEMPERATURE. | | | Precip. in inches & 100ths |
|---|---|---|---|---|
| | Mean. | Max. | Min. | |
| 1 | 76 | 84 | 67 | .......... |
| 2 | 62 | 70 | 54 | .32 |
| 3 | 76 | 88 | 63 | T |
| 4 | 54 | 59 | 49 | .46 |
| 5 | 60 | 73 | 46 | .01* |
| 6 | 66 | 81 | 52 | .......... |
| 7 | 68 | 80 | 56 | .......... |
| 8 | 73 | 82 | 64 | .......... |
| 9 | 72 | 82 | 62 | .......... |
| 10 | 75 | 84 | 66 | .......... |
| 11 | 76 | 83 | 68 | .......... |
| 12 | 66 | 75 | 57 | .08 |
| 13 | 74 | 84 | 65 | .......... |
| 14 | 65 | 78 | 52 | .82 |
| 15 | 54 | 66 | 43 | .......... |
| 16 | 58 | 69 | 47 | .......... |
| 17 | 58 | 69 | 46 | .......... |
| 18 | 52 | 63 | 40 | T† |
| 19 | 60 | 77 | 43 | .......... |
| 20 | 64 | 77 | 52 | .......... |
| 21 | 64 | 74 | 53 | T |
| 22 | 72 | 84 | 61 | T |
| 23 | 62 | 68 | 57 | .02 |
| 24 | 56 | 63 | 50 | .02 |
| 25 | 50 | 61 | 40 | .......... |
| 26 | 52 | 60 | 43 | .01 |
| 27 | 58 | 78 | 38 | T† |
| 28 | 62 | 77 | 48 | .......... |
| 29 | 57 | 62 | 52 | .......... |
| 30 | 66 | 81 | 52 | .......... |

NOTE.—Barometer reduced to sea level. "T" indicates trace of precipitation. * Dew. † Frost.

### SUMMARY.

Mean barometer, 30.030. Highest barometer, 30.468; date, 27th. Lowest barometer, 29.621; date, 3d. Mean temperature, 63.6. Highest temperature, 88; date 3d. Lowest temperature, 38; date, 27th. Greatest daily range of temperature, 40; date, 27th. Least daily range of temperature, 10; date, 4th.

*Mean temperature for this month in —*

| | | | | | |
|---|---|---|---|---|---|
| 1871 | 62.2 | 1878 | 64.1 | 1884 | 68.7 |
| 1872 | 62.4 | 1879 | 62.5 | 1885 | 64.5 |
| 1873 | 60.4 | 1880 | 62.9 | 1886 | 65.3 |
| 1874 | 62.7 | 1881 | 66.0 | 1887 | 65.3 |
| 1875 | 62.5 | 1882 | 67.5 | 1888 | 61.3 |
| 1876 | 62.2 | 1883 | 60.8 | 1889 | 63.6 |
| 1877 | 66.4 | | | | |

Total excess or deficiency in temperature during month, 0. Total excess in temperature since January 1st, 261°. Prevailing direction of wind, south. Total movement of wind, 5,393 miles. Extreme velocity of wind, direction, and date,33 miles, southeast, on 22d. Total precipitation, 1.74 inches. Number of days on which .01 inch or more of precipitation fell, 7.

*Total precipitation (in inches) for this month in —*

| | | | | | |
|---|---|---|---|---|---|
| 1871 | 2.73 | 1878 | 3.22 | 1884 | 4.91 |
| 1872 | 3.24 | 1879 | 1.43 | 1885 | 2.50 |
| 1873 | 1.86 | 1880 | 2.91 | 1886 | 4.45 |
| 1874 | 7.18 | 1881 | 8.36 | 1887 | 2.44 |
| 1875 | 2.55 | 1882 | 0.51 | 1888 | 0.24 |
| 1876 | 4.93 | 1883 | 4.53 | 1889 | 1.74 |
| 1877 | 2.05 | | | | |

Total deficiency in precipitation during month, 1.83. Total deficiency in precipitation since January 1st, 9.09. Number of cloudless days, 11; Partly cloudy days, 8; Cloudy days, 11. Date of frost, light, 18th; killing, 27th. Thunder storms, 23d.

## OCTOBER.

| Date. | TEMPERATURE. | | | Precip. in inches & 100ths |
|---|---|---|---|---|
| | Mean. | Max. | Min. | |
| 1 | 64 | 79 | 50 | .......... |
| 2 | 72 | 84 | 59 | .......... |
| 3 | 64 | 79 | 49 | .......... |
| 4 | 66 | 80 | 51 | .......... |
| 5 | 52 | 60 | 43 | .......... |
| 6 | 46 | 58 | 34 | .......... |
| 7 | 52 | 65 | 40 | .......... |
| 8 | 56 | 69 | 42 | .......... |
| 9 | 59 | 77 | 41 | .......... |
| 10 | 63 | 79 | 47 | .......... |
| 11 | 67 | 79 | 55 | T |
| 12 | 60 | 70 | 50 | T |
| 13 | 54 | 60 | 47 | .......... |
| 14 | 50 | 59 | 40 | .......... |
| 15 | 52 | 59 | 46 | .01 |
| 16 | 55 | 60 | 50 | .......... |
| 17 | 50 | 60 | 39 | .......... |
| 18 | 51 | 67 | 35 | .......... |
| 19 | 46 | 51 | 41 | .......... |
| 20 | 39 | 50 | 28 | .......... |
| 21 | 43 | 50 | 36 | .......... |
| 22 | 45 | 48 | 42 | .04 |
| 23 | 48 | 55 | 41 | .......... |
| 24 | 50 | 53 | 47 | T |
| 25 | 44 | 49 | 39 | .......... |
| 26 | 42 | 49 | 35 | .......... |
| 27 | 46 | 60 | 32 | .......... |
| 28 | 50 | 62 | 37 | .......... |
| 29 | 49 | 60 | 38 | T |
| 30 | 44 | 45 | 42 | .10 |
| 31 | 42 | 45 | 39 | .19 |

NOTE.—Barometer reduced to sea level. "T" indicates trace of rain fall.

### SUMMARY.

Mean barometer, 30.168. Highest barometer, 30.526; date, 6th. Lowest barometer, 29.811; date, 24th. Mean temperature, 52.2. Highest temperature, 84; date, 2d. Lowest temperature, 28; date 20th. Greatest daily range, 36°; date, 9th. Least daily range of temperature, 3°; date, 30th.

*Mean temperature for this month in —*

| | | | | | |
|---|---|---|---|---|---|
| 1871 | 53.2 | 1878 | 52.0 | 1884 | 57.3 |
| 1872 | 53.0 | 1879 | 61.5 | 1885 | 49.8 |
| 1873 | 48.4 | 1880 | 49.2 | 1886 | 58.3 |
| 1874 | 53.6 | 1881 | 54.4 | 1887 | 50.7 |
| 1875 | 49.6 | 1882 | 57.2 | 1888 | 48.4 |
| 1876 | 49.9 | 1883 | 49.4 | 1889 | 52.2 |
| 1877 | 51.2 | | | | |

Total deficiency in temperature during month, 12°. Total excess in temperature since January 1st, 249°. Prevailing direction of the wind, southeast and south. Total movement of wind, 5,094 miles. Extreme velocity of wind, direction, and date, 45 miles, northwest; date, 25th. Total precipitation, 0.34 inches. Number of days on which .01 inch or more fell, 4.

*Total precipitation (in inches and hundredths) for this month in —*

| | | | | | |
|---|---|---|---|---|---|
| 1871 | 2.06 | 1877 | 5.86 | 1883 | 5.03 |
| 1872 | 3.89 | 1878 | 0.55 | 1884 | 5.81 |
| 1873 | 1.82 | 1879 | 3.64 | 1885 | 3.86 |
| 1874 | 1.45 | 1880 | 3.54 | 1886 | 1.83 |
| 1875 | 1.16 | 1881 | 4.84 | 1887 | 0.72 |
| 1876 | 0.69 | 1882 | 3.09 | 1888 | 1.16 |

Total deficiency in precipitation during month, 2.70. Total deficiency in precipitation since January 1st, 11.79. Number of cloudless days, 13. Partly cloudy days, 8. Cloudy days, 10. Dates of frost, 6th, 18th, and 20th.

## NOVEMBER.

| Date. | TEMPERATURE. | | | Precip. in inches & 100ths |
|---|---|---|---|---|
| | Mean. | Max. | Min. | |
| 1 | 33 | 34 | 32 | .85 |
| 2 | 40 | 48 | 32 | T |
| 3 | 40 | 48 | 33 | ........... |
| 4 | 30 | 35 | 24 | ........... |
| 5 | 34 | 47 | 22 | ........... |
| 6 | 44 | 56 | 31 | ........... |
| 7 | 39 | 45 | 33 | ........... |
| 8 | 38 | 46 | 30 | ........... |
| 9 | 44 | 57 | 32 | ........... |
| 10 | 48 | 60 | 35 | ........... |
| 11 | 36 | 40 | 31 | T |
| 12 | 32 | 38 | 26 | T |
| 13 | 38 | 49 | 26 | ........... |
| 14 | 30 | 36 | 23 | ........... |
| 15 | 32 | 40 | 24 | ........... |
| 16 | 32 | 44 | 20 | ........... |
| 17 | 37 | 50 | 24 | ........... |
| 18 | 39 | 52 | 26 | ........... |
| 19 | 42 | 53 | 30 | ........... |
| 20 | 44 | 55 | 33 | ........... |
| 21 | 44 | 50 | 39 | T |
| 22 | 41 | 49 | 33 | ........... |
| 23 | 46 | 55 | 36 | ........... |
| 24 | 24 | 28 | 21 | ........... |
| 25 | 28 | 36 | 19 | ........... |
| 26 | 33 | 35 | 31 | .02 |
| 27 | 21 | 27 | 15 | T |
| 28 | 16 | 24 | 7 | ........... |
| 29 | 21 | 30 | 12 | ........... |
| 30 | 36 | 51 | 22 | ........... |

NOTE.—Barometer reduced to sea level. "T" indicates trace of rainfall.

### SUMMARY.

Mean barometer, 30.194. Highest barometer, 30.702; date, 5th. Lowest barometer, 29.641; date, 20th. Mean temperature, 35.3. Highest temperature, 60; date 10th. Lowest temperature, 7; date, 28th. Greatest daily range of temperature, 29, on the 30th. Least daily range of temperature, 2, 1st.

*Mean temperature for this month in—*

| | | | | | |
|---|---|---|---|---|---|
| 1871 | 30.7 | 1877 | 36.0 | 1883 | 39.2 |
| 1872 | 30.1 | 1878 | 43.8 | 1884 | 89.3 |
| 1873 | 38.2 | 1879 | 40.3 | 1885 | 39.9 |
| 1874 | 36.0 | 1880 | 26.4 | 1886 | 34.2 |
| 1875 | 32.6 | 1881 | 36.9 | 1887 | 39.6 |
| 1876 | 33.1 | 1882 | 39.7 | 1888 | 36.7 |

Total deficiency in temperature during month, 26°. Total excess in temperature since January 1st, 223°. Prevailing direction of wind, northwest. Total movement of wind, 6,075 miles. Extreme velocity of wind, direction, and date, 45, 28th. Total precipitation, 0.87 inches. Number of days on which .01 inch or more of precipitation fell, 2.

*Total precipitation (in inches and hundredths) for this month in—*

| | | | | | |
|---|---|---|---|---|---|
| 1871 | 4.22 | 1877 | 1.36 | 1883 | 0.64 |
| 1872 | 0.87 | 1878 | 0.29 | 1884 | 0.32 |
| 1873 | 0.19 | 1879 | 4.25 | 1885 | 0.73 |
| 1874 | 1.05 | 1880 | 0.70 | 1886 | 1.54 |
| 1875 | 0.13 | 1881 | 1.29 | 1887 | 0.89 |
| 1876 | 1.17 | 1882 | 2.05 | 1888 | 0.12 |

Total deficiency in precipitation during month, .45. Total deficiency in precipitation since January 1st, 12.44. Number of cloudless days, 11. Partly cloudy days, 11. Cloudy days, 8. Dates of frosts, ——

## DECEMBER.

| Date. | TEMPERATURE. | | | Precip. in inches & 100ths |
|---|---|---|---|---|
| | Mean. | Max. | Min. | |
| 1 | 46 | 59 | 32 | ........... |
| 2 | 46 | 55 | 36 | T |
| 3 | 36 | 39 | 33 | ........... |
| 4 | 37 | 42 | 32 | T |
| 5 | 34 | 37 | 31 | T |
| 6 | 32 | 39 | 25 | ........... |
| 7 | 39 | 44 | 34 | ........... |
| 8 | 50 | 60 | 40 | ........... |
| 9 | 46 | 59 | 33 | ........... |
| 10 | 44 | 50 | 38 | .02 |
| 11 | 46 | 60 | 31 | ........... |
| 12 | 46 | 57 | 34 | ........... |
| 13 | 30 | 36 | 24 | ........... |
| 14 | 36 | 46 | 26 | ........... |
| 15 | 44 | 58 | 31 | ........... |
| 16 | 44 | 48 | 40 | T |
| 17 | 38 | 40 | 35 | T |
| 18 | 48 | 62 | 35 | ........... |
| 19 | 37 | 40 | 34 | .03 |
| 20 | 34 | 37 | 30 | .02 |
| 21 | 36 | 39 | 32 | .02 |
| 22 | 36 | 49 | 23 | ........... |
| 23 | 50 | 63 | 37 | ........... |
| 24 | 58 | 68 | 47 | ........... |
| 25 | 42 | 54 | 29 | ........... |
| 26 | 32 | 43 | 22 | ........... |
| 27 | 44 | 57 | 30 | ........... |
| 28 | 52 | 62 | 41 | .41 |
| 29 | 16 | 21 | 10 | ........... |
| 30 | 19 | 28 | 10 | ........... |
| 31 | 30 | 40 | 21 | ........... |

NOTE.—Barometer reduced to sea level. "T" indicates trace of precipitation.

### SUMMARY.

Mean barometer, 30.064. Highest barometer, 30.652; date, 30th. Lowest barometer, 29.239; date, 28th. Mean temperature, 39.4. Highest temperature, 68; date, 24th. Lowest temperature, 10; date, 30th. Greatest daily range of temperature, 29; date, 11th. Least daily range of temperature, 5; date, 17th.

*Mean temperature for this month in—*

| | | | | | |
|---|---|---|---|---|---|
| 1871 | 18.3 | 1878 | 21.5 | 1884 | 17.3 |
| 1872 | 18.2 | 1879 | 17.3 | 1885 | 28.6 |
| 1873 | 24.8 | 1880 | 18.4 | 1886 | 17.9 |
| 1874 | 28.2 | 1881 | 36.0 | 1887 | 23.6 |
| 1875 | 33.9 | 1882 | 24.6 | 1888 | 30.4 |
| 1876 | 19.0 | 1883 | 28.6 | 1889 | 39.4 |
| 1877 | 38.9 | | | | |

Total excess in temperature during month, 458°. Total excess in temperature since January 1st, 681°. Prevailing direction of wind, south. Total movement of wind, 6,440 miles. Extreme velocity of wind, direction, and date, 48 miles, northwest, on the 28th. Total precipitation, 0.50 inches. Number of days on which .01 inch or more of precipitation fell, 5.

*Total precipitation (in inches) for this month in—*

| | | | | | |
|---|---|---|---|---|---|
| 1871 | 0.91 | 1878 | 0.27 | 1884 | 0.72 |
| 1872 | 0.12 | 1879 | 1.75 | 1885 | 1.17 |
| 1873 | 0.93 | 1880 | 0.28 | 1886 | 1.46 |
| 1874 | 0.54 | 1881 | 1.56 | 1887 | 1.11 |
| 1875 | 1.00 | 1882 | 0.92 | 1888 | 0.96 |
| 1876 | 0.16 | 1883 | 0.73 | 1889 | 0.50 |
| 1877 | 2.14 | | | | |

Total deficiency in precipitation during month, 0.52. Total deficiency in precipitation since January 1st, 12.76. Number of cloudless days, 7. Partly cloudy days, 10. Cloudy days, 14.

# THE RAINFALL OF NEBRASKA.

Compilation of all available data on the rainfall of Nebraska, in inches, showing the greatest, least, and average values for each month of the year, from 1853 to 1889. With Geographical Arrangement of Stations, giving their Latitude, Longitude, Elevation, Name of Observer, and Length of Time of Record.

Prepared and presented by GOODWIN D. SWEZEY, Director of Boswell Observatory, Doane College, Crete, Nebraska.

## THE RAINFALL OF NEBRASKA.

| NAMES OF STATIONS. | JANUARY. | | | | | FEBRUARY. | | | | | MARCH. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Av. | Maximum. | | Minimum. | | Av. | Maximum. | | Minimum. | | Av. | Maximum. | | Minimum. | |
| | *Ins.* | *Ins.* | *Years.* | *Ins.* | *Years.* | *Ins.* | *Ins.* | *Years.* | *Ins.* | *Years.* | *Ins.* | *Ins.* | *Years.* | *Ins.* | *Years.* |
| Fort Robinson | 0.54 | 1.11 | 1887 | 0.08 | 1889 | 0.60 | 1.12 | 1885 | 0.32 | 1889 | 0.96 | 1.80 | 1884 | T | 1889 |
| Camp Sheridan | 0.32 | 0.62 | 1879 | 0.15 | 1877 | 0.51 | 1.14 | 1881 | T | 1877 | 1.41 | 3.69 | 1878 | 0.42 | 1879 |
| Hay Springs | 0.54 | 0.81 | 1887 | 0.44 | 1888 | 0.88 | 1.22 | 1888 | 0.41 | 1887 | 1.12 | 1.51 | 1886 | 0.82 | 1889 |
| Valentine | 0.45 | 1.27 | 1889 | 0.04 | 1888 | 0.42 | 0.75 | 1888 | 0.15 | 1889 | 0.81 | 1.44 | 1888 | 0.23 | 1887 |
| Fort Niobrara | 0.43 | 1.08 | 1886 | T | 1888 | 0.60 | 1.60 | 1887 | 0.18 | 1889 | 0.92 | 1.84 | 1881 | 0.08 | 1882 |
| Kennedy | ...... | ...... | ...... | ...... | ...... | 0.62 | ...... | ...... | ...... | ...... | 2.00 | ...... | ...... | ...... | ...... |
| Creighton | 1.75 | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | 0.22 | ...... | ...... | ...... | ...... |
| Santee Agency | 0.90 | 1.55 | 1873 | 0.00 | 1872 | 0.84 | 1.20 | 1875 | 0.35 | 1872 | 0.72 | 1.30 | 1872 | 0.30 | 1873 |
| Neligh | 0.44 | ...... | ...... | ...... | ...... | 0.11 | ...... | ...... | ...... | ...... | 1.90 | ...... | ...... | ...... | ...... |
| Oakdale | 0.88 | ...... | ...... | ...... | ...... | 0.13 | ...... | ...... | ...... | ...... | 0.20 | ...... | ...... | ...... | ...... |
| Dakota City | 0.62 | 0.70 | 1868 | 0.55 | 1869 | 0.50 | ...... | ...... | ...... | ...... | 0.65 | ...... | ...... | ...... | ...... |
| Kimball | 0.25 | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Fort Sidney | 0.45 | 1.64 | 1877 | T | '76-'78 | 0.51 | 2.00 | 1887 | T | '73-'76 | 0.86 | 2.30 | 1878 | T | 1873 |
| North Platte | 0.49 | 2.33 | 1879 | 0.00 | 1878 | 0.35 | 1.38 | 1883 | 0.03 | 1880 | 0.64 | 1.82 | 1884 | 0.04 | 1882 |
| Fort McPherson | 0.28 | 1.28 | 1877 | T | 1869 | 0.42 | 1.50 | 1875 | T | 1880 | 0.61 | 2.25 | 1875 | 0.00 | 1876 |
| Sargent | 0.66 | 1.00 | 1889 | 0.33 | 1884 | 0.28 | 0.40 | 1883 | 0.17 | 1889 | 0.84 | 0.90 | 1883 | 0.78 | 1889 |
| Ausley | 0.30 | ...... | ...... | ...... | ...... | T | ...... | ...... | ...... | ...... | 2.20 | ...... | ...... | ...... | ...... |
| North Loup | 0.93 | ...... | ...... | ...... | ...... | 0.11 | ...... | ...... | ...... | ...... | 0.65 | ...... | ...... | ...... | ...... |
| Fort Hartsuff | 0.21 | 0.50 | 1879 | T | 1878 | 0.24 | 0.60 | 1879 | T | 1878 | 0.60 | 1.88 | 1881 | 0.20 | 1877 |
| Genoa | 0.87 | 2.13 | 1886 | 0.20 | 1879 | 0.65 | 1.20 | 1884 | 0.10 | 1889 | 1.20 | 3.55 | 1876 | T | 1882 |
| Palmer | 1.35 | 1.70 | 1889 | 1.00 | 1888 | 0.45 | 0.80 | 1888 | 0.10 | 1889 | 1.33 | 2.00 | 1888 | 0.75 | 1889 |
| Central City | 0.83 | 1.00 | '79-'83 | 0.50 | 1884 | 1.09 | 2.50 | 1879 | 0.25 | 1884 | 1.70 | 4.00 | 1886 | 0.00 | 1883 |
| Norfolk | 0.38 | 0.58 | '75-'77 | 0.12 | 1878 | 1.07 | 4.62 | 1875 | T | 1879 | 1.03 | 1.94 | 1884 | 0.45 | '73-'78 |
| Madison | 0.35 | ...... | ...... | ...... | ...... | 1.15 | ...... | ...... | ...... | ...... | 0.59 | ...... | ...... | ...... | ...... |
| West Hill | 0.73 | 1.13 | 1886 | 0.31 | 1885 | 0.39 | 0.65 | 1886 | 0.07 | 1889 | 1.22 | 2.45 | 1886 | 0.51 | 1885 |
| Stromsburg | 1.19 | 1.86 | 1886 | 0.50 | 1885 | 0.59 | 0.67 | 1886 | 0.52 | 1885 | 2.71 | 4.13 | 1886 | 1.29 | 1884 |
| Richland | 1.09 | 2.28 | 1861 | 0.30 | 1870 | 0.92 | 1.50 | 1861 | 0.35 | 1868 | ...... | ...... | ...... | ...... | ...... |
| Schuyler | 0.63 | ...... | ...... | ...... | ...... | 1.40 | ...... | ...... | ...... | ...... | 1.33 | ...... | ...... | ...... | ...... |
| David City | ...... | ...... | ...... | ...... | ...... | 0.20 | ...... | ...... | ...... | ...... | 0.15? | ...... | ...... | ...... | ...... |
| West Point | 1.06 | 1.87 | 1888 | 0.40 | 1885 | 0.58 | 1.05 | 1886 | 0.10 | 1889 | 1.38 | 2.50 | 1886 | 0.25 | 1885 |
| Fremont | 1.39 | 3.08 | 1883 | 0.50 | 1885 | 0.80 | 1.19 | '83-'84 | 0.35 | '88-'89 | 1.88 | 4.93 | 1886 | 0.33 | 1885 |
| Yutan | 1.02 | 2.30 | 1886 | 0.35 | 1887 | 0.61 | 0.65 | 1886 | 0.57 | 1885 | 1.44 | 2.71 | 1886 | 0.17 | 1885 |
| Clear Creek | 0.62 | 1.10 | 1883 | 0.16 | 1879 | 0.93 | 2.93 | 1881 | 0.02 | 1880 | 1.83 | 4.00 | 1876 | 0.32 | 1880 |
| Ashland | 1.54 | 2.00 | 1886 | 0.58 | 1881 | 0.74 | 1.29 | 1885 | 0.14 | 1889 | 2.22 | 4.64 | 1888 | 0.31 | 1885 |
| Omaha Agency | 0.40 | 0.80 | 1868 | 0.13 | 1869 | 0.82 | 1.65 | 1869 | 0.15 | 1872 | 1.02 | 1.95 | 1870 | 0.30 | 1869 |
| Decatur | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | 0.63 | ...... | ...... | ...... | ...... |
| De Soto | 0.78 | 2.24 | 1886 | 0.15 | 1879 | 0.94 | 2.59 | 1881 | 0.12 | 1870 | 1.49 | 4.77 | 1888 | 0.15 | 1882 |
| Omaha | 0.76 | 1.82 | 1858 | 0.08 | 1872 | 0.83 | 3.09 | 1881 | 0.04 | 1873 | 1.45 | 4.91 | 1884 | 0.18 | 1871 |
| Bellevue | 1.09 | 2.47 | 1862 | 0.13 | 1865 | 1.42 | 4.00 | 1865 | 0.00 | 1870 | 2.15 | 15.60? | 1858 | 0.04 | '60-'61 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Culbertson | 0.50 | | | | | 0.51 | | | | | 1.19 | | | | |
| Stratton | | | | | | | | | | | 1.38 | | | | |
| Red Willow | 0.82 | 1.29 | 1886 | 0.33 | 1884 | 0.91 | 1.74 | 1885 | T | 1889 | 0.93 | 1.92 | 1886 | 0.02 | 1883 |
| Richmond | 0.36 | | | | | 1.62 | | | | | 1.33 | | | | |
| Ravenna | 1.02 | | | | | 0.41 | 0.79 | 1888 | 0.03 | 1889 | 2.46 | 3.46 | 1888 | 1.45 | 1889 |
| Beaver Creek | 0.47 | 0.59 | 1883 | 0.36 | 1885 | 0.80 | 0.87 | 1885 | 0.74 | 1883 | 1.03 | 3.16 | 1886 | 0.00 | 1882 |
| Gibbon | | | | | | | | | | | 2.14 | | | | |
| Fort Kearney | 0.59 | 1.45 | 1858 | 0.00 | 1853 | 0.40 | 1.33 | 1854 | 0.00 | 1857 | 1.17 | 6.12 | 1849 | 0.00 | '60-'82 |
| Keene | 0.30 | | | | | 0.46 | 0.55 | 1885 | 0.38 | 1884 | 0.64 | 1.08 | 1884 | 0.20 | 1885 |
| Minden | 0.78 | 1.37 | 1889 | 0.20 | 1888 | 0.85 | 1.36 | '83-'84 | 0.15 | 1889 | 1.84 | 3.91 | 1888 | 0.05 | 1882 |
| Franklin | 0.88 | 1.60 | 1889 | 0.16 | 1888 | 0.33 | 0.45 | 1888 | 0.20 | 1889 | 1.91 | 2.15 | 1889 | 1.67 | 1888 |
| Hastings | 0.32 | | | | | 0.21 | | | | | 1.14 | | | | |
| Inavale | 0.20 | 0.25 | 1884 | 0.15 | 1882 | 0.53 | 1.08 | 1883 | 0.20 | 1882 | 0.85 | 2.30 | 1884 | 0.00 | 1882 |
| Red Cloud | 0.41 | | | | | 0.25 | | | | | 0.36 | 0.68 | 1872 | 0.05 | 1873 |
| Marquette | 0.66 | 1.90 | 1886 | 0.12? | 1886 | 0.60 | 0.85 | 1887 | 0.12 | 1889 | 1.25 | 3.52 | 1886 | 0.02 | 1887 |
| Stockham | 1.04 | 3.60 | 1886 | 0.25 | 1887 | 1.61 | 5.40 | 1885 | 0.50 | '82-'81 | 0.71 | 2.00 | 1886 | 0.20 | 1887 |
| Harvard | 2.65 | | | | | 0.42 | | | | | | | | | |
| Sutton | 0.48 | 0.70 | 1883 | 0.25 | 1882 | 1.34 | 1.95 | 1882 | 0.72 | 1883 | 0.32 | 0.65 | 1883 | 0.00 | 1882 |
| Superior | 1.63 | 4.12 | 1884 | 0.25 | 1882 | 0.79 | 1.11 | 1883 | 0.35 | 1882 | 1.05 | 2.76 | 1884 | 0.15 | 1882 |
| York | | | | | | 0.96 | | | | | 4.18 | 6.25 | 1885 | 2.12 | 1886 |
| Fairmont | 2.49 | | | | | | | | | | | | | | |
| Seward | | | | | | 1.06 | | | | | 0.45 | | | | |
| Tamora | | | | | | 1.84 | | | | | | | | | |
| Utica | 1.19 | | | | | 1.38 | | | | | 0.15 | | | | |
| Milford | 0.59 | | | | | 0.50 | | | | | 0.07 | 0.13 | 1883 | 0.01 | 1882 |
| Crete | 0.73 | 1.63 | 1886 | 0.08 | 1885 | 0.59 | 0.93 | 1887 | 0.25 | 1889 | 1.27 | 4.63 | 1888 | 0.09 | 1887 |
| De Witt | 1.30 | 2.00 | '83-'86 | 0.50 | 1885 | 1.20 | 1.60 | 1886 | 0.80 | 1884 | 1.17 | 1.80 | 1886 | 0.20 | 1882 |
| Fairbury | 1.22 | 2.09 | 1884 | 0.30 | 1887 | 0.60 | 0.98 | 1886 | 0.36 | 1889 | 2.36 | 5.23 | 1884 | 0.65 | 1887 |
| Lincoln | 0.71 | 1.28 | 1889 | 0.15 | 1887 | 1.39 | 2.76 | 1881 | 0.23 | 1889 | 1.42 | 3.03 | 1888 | 0.45 | 1882 |
| Agricultural College | 0.75 | 0.94 | 1883 | 0.53 | 1882 | 0.97 | 1.22 | 1883 | 0.70 | 1882 | 0.92 | 2.20 | 1884 | 0.45 | 1882 |
| Cedar Bend | 0.38 | 0.60 | 1883 | 0.15 | 1882 | 0.76 | | | | | 0.13 | 0.20 | 1882 | 0.07 | 1883 |
| Glendale | 0.91 | 1.30 | 1869 | 0.59 | 1867 | 2.10 | 2.70 | 1867 | 1.15 | 1868 | 2.00 | 2.75 | 1868 | 0.60 | 1869 |
| Plattsmouth | 0.74 | 1.85 | 1883 | 0.06 | 1876 | 0.80 | 2.19 | 1883 | 0.08 | 1886 | 1.78 | 3.38 | 1875 | 0.20 | 1887 |
| Weeping Water | 1.12 | 2.05 | 1886 | 0.50 | 1884 | 0.54 | 0.87 | 1888 | 0.24 | 1889 | 1.58 | 3.87 | 1888 | 0.24 | 1885 |
| Palmyra | 0.70 | | | | | | | | | | 0.40 | | | | |
| Syracuse | 0.67 | 1.15 | 1889 | 0.26 | 1888 | 1.10 | 2.90 | 1885 | 0.47 | 1889 | 1.53 | 3.45 | 1888 | 0.18 | 1885 |
| Emerson | 0.73 | 1.65 | 1877 | 0.10 | 1872 | 0.88 | 1.60 | 1874 | 0.12 | 1873 | 2.30 | 7.45 | 1876 | 0.30 | 1873 |
| Nursery Hill | | | | | | 7.75 | | | | | 3.86 | | | | |
| Nebraska City | 1.12 | 3.35 | 1871 | 0.41 | 1888 | 0.74 | 1.38 | 1884 | 0.00 | 1870 | 1.66 | 4.29 | 1888 | 0.35 | 1885 |
| Tecumseh | 1.23 | 2.00 | 1886 | 0.22 | 1888 | 1.54 | 2.40 | 1887 | 0.90 | 1889 | 1.33 | 2.75 | 1888 | 0.33 | 1885 |
| Table Rock | 0.26 | 0.40 | 1884 | 0.09 | 1882 | 0.70 | 0.86 | 1885 | 0.45 | 1884 | 0.92 | 2.22 | 1884 | 0.10 | 1883 |
| Pawnee City | 0.43 | 0.75 | 1882 | 0.11 | 1884 | 0.50 | | | | | 0.41 | 0.60 | 1882 | 0.22 | 1884 |
| Mission Creek | 0.97 | 1.87 | 1886 | 0.25 | 1882 | 0.59 | 0.66 | 1882 | 0.56 | '84-'86 | 2.40 | 4.31 | 1884 | 0.84 | 1882 |
| Peru | 0.47 | 0.70 | 1883 | 0.30 | 1882 | 1.10 | 1.50 | 1882 | 0.70 | 1884 | 1.60 | 3.30 | 1884 | 0.50 | 1883 |
| Howard | 0.79 | 1.63 | 1878 | 0.35 | 1881 | 0.95 | 3.30 | 1881 | 0.13 | 1880 | 1.94 | 5.61 | 1876 | 0.26 | 1880 |
| Johnson | 0.50 | | | | | 0.50 | 1.01 | 1884 | T | 1883 | 1.60 | 3.71 | 1884 | 0.55 | '82-'83 |
| Brownville | 0.75 | 0.90 | 1887 | 0.60 | 1888 | 1.17 | 1.70 | 1888 | 0.80 | 1886 | 2.36 | 3.35 | 1888 | 1.72 | 1887 |
| Stella | 0.44 | | | | | 0.90 | | | | | | | | | |
| Dawson | 0.82 | 1.31 | 1885 | 0.33 | 1884 | 0.79 | 1.34 | 1885 | 0.24 | 1884 | 2.58 | 4.90 | 1884 | 0.25 | 1885 |
| Falls City | 0.98 | 1.51 | 1889 | 0.65 | 1884 | 1.05 | 1.92 | 1888 | 0.39 | 1884 | 1.87 | 2.78 | 1884 | 0.30 | 1885 |

## THE RAINFALL OF NEBRASKA—CONTINUED.

| NAMES OF STATIONS. | APRIL. | | | | | MAY. | | | | | JUNE. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Av. | Maximum. | | Minimum. | | Av. | Maximum. | | Minimum. | | Av. | Maximum. | | Minimum. | |
| | *Ins* | *Ins.* | *Years.* | *Ins.* | *Years.* | *Ins.* | *Ins.* | *Years.* | *Ins.* | *Years.* | *Ins.* | *Ins.* | *Years.* | *Ins.* | *Years.* |
| Fort Robinson | 1.71 | 2.60 | '85-'87 | 0.47 | 1886 | 2.50 | 3.72 | 1887 | 1.24 | 1886 | 2.16 | 3.94 | 1885 | 0.72 | 1887 |
| Camp Sheridan | 1.64 | 3.39 | 1879 | 0.33 | 1877 | 3.36 | 6.53 | 1878 | 1.06 | 1880 | 3.50 | 5.05 | 1878 | 2.09 | 1877 |
| Hay Springs | 1.82 | 2.30 | 1887 | 0.88 | 1888 | 4.64 | 7.25 | 1888 | 1.80 | 1886 | 3.23 | 3.60 | 1887 | 2.66 | 1886 |
| Valentine | 2.21 | 3.87 | 1889 | 1.05 | 1888 | 4.32 | 9.35 | 1888 | 2.05 | 1889 | 2.86 | 3.89 | 1887 | 2.25 | 1886 |
| Fort Niobrara | 2.65 | 4.08 | 1887 | 0.96 | 1888 | 3.94 | 10.62 | 1888 | 1.14 | 1886 | 2.85 | 4.46 | 1883 | 1.96 | 1888 |
| Kennedy | 5.94 | ...... | ...... | ...... | ...... | 3.38 | ...... | ...... | ...... | ...... | 3.06 | ...... | ...... | ...... | ...... |
| Creighton | 2.62 | ...... | ...... | ...... | ...... | 2.12 | ...... | ...... | ...... | ...... | 3.53 | ...... | ...... | ...... | ...... |
| Santee Agency | 2.51 | 5.57 | 1873 | 0.35 | 1874 | 3.90 | 6.85 | 1875 | 1.80 | 1874 | 4.84 | 7.00 | 1875 | 3.15 | 1872 |
| Neligh | 2.47 | ...... | ...... | ...... | ...... | 5.05 | ...... | ...... | ...... | ...... | 0.47 | ...... | ...... | ...... | ...... |
| Oakdale | 1.68 | ...... | ...... | ...... | ...... | 1.57 | ...... | ...... | ...... | ...... | 4.90 | ...... | ...... | ...... | ...... |
| Ponca | ...... | ...... | ...... | ...... | ...... | 6.00 | ...... | ...... | ...... | ...... | 11.38 | ...... | ...... | ...... | ...... |
| Gering | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | 1.16 | ...... | ...... | ...... | ...... |
| Kimball | 0.47 | ...... | ...... | ...... | ...... | 3.72 | ...... | ...... | ...... | ...... | 1.85 | 2.54 | 1888 | 1.16 | 1889 |
| Fort Sidney | 1.53 | 3.21 | 1879 | 0.16 | 1878 | 2.83 | 4.98 | 1874 | 1.05 | 1887 | 1.20 | 2.17 | 1888 | 0.52 | 1886 |
| North Platte | 2.03 | 6.21 | 1875 | 0.16 | 1880 | 3.09 | 4.84 | 1881 | 0.81 | 1887 | 3.34 | 7.49 | 1883 | 0.49 | 1876 |
| Fort McPherson | 1.67 | 4.72 | 1875 | 0.00 | 1876 | 3.73 | 10.00 | 1868 | 0.78 | 1869 | 3.34 | 9.75 | 1868 | 0.00 | 1876 |
| Sargent | 2.41 | 2.92 | 1885 | 1.50 | 1889 | 4.67 | 8.30 | 1888 | 1.03 | 1889 | 3.64 | 6.65 | 1883 | 1.25 | 1884 |
| Ansley | 0.50 | ...... | ...... | ...... | ...... | 1.30 | ...... | ...... | ...... | ...... | 2.93 | ...... | ...... | ...... | ...... |
| North Loup | 1.88 | ...... | ...... | ...... | ...... | 0.98 | ...... | ...... | ...... | ...... | 3.84 | ...... | ...... | ...... | ...... |
| Fort Hartsuff | 1.32 | 2.16 | 1877 | 0.48 | 1880 | 3.93 | 8.42 | 1881 | 1.00 | 1880 | 4.14 | 8.52 | 1880 | 1.24 | 1876 |
| Genoa | 2.70 | 5.32 | 1885 | 1.20 | 1878 | 4.20 | 7.80 | 1877 | 0.83 | 1880 | 4.21 | 7.35 | 1880 | 2.47 | 1884 |
| Palmer | 3.25 | 4.00 | 1888 | 2.50 | 1889 | 2.25 | 3.50 | 1888 | 1.00 | 1889 | 2.82 | 3.65 | 1889 | 2.00 | 1888 |
| Central City | 2.54 | 5.60 | 1885 | 1.30 | 1883 | 3.37 | 7.20 | 1886 | 1.50 | 1880 | 3.02 | 5.30 | 1883 | 1.70 | 1886 |
| Norfolk | 2.08 | 3.90 | 1877 | 0.72 | 1874 | 5.04 | 8.97 | 1877 | 2.15 | 1876 | 4.48 | 6.38 | 1878 | 0.77 | 1884 |
| Madison | 3.75 | ...... | ...... | ...... | ...... | 6.81 | ...... | ...... | ...... | ...... | 0.88 | ...... | ...... | ...... | ...... |
| West Hill | 2.89 | 4.65 | 1885 | 1.91 | 1886 | 1.37 | 1.65 | 1889 | 1.13 | 1885 | 2.31 | 3.82 | 1886 | 1.49 | 1889 |
| Stanton | 2.88 | ...... | ...... | ...... | ...... | 3.10 | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Stromsburg | 4.12 | 5.05 | 1885 | 3.23 | 1886 | 4.53 | 5.52 | 1886 | 3.86 | 1884 | 4.48 | 8.37 | 1886 | 1.93 | 1884 |
| Schuyler | 2.90 | ...... | ...... | ...... | ...... | 1.44 | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| David City | 2.48 | ...... | ...... | ...... | ...... | 2.43 | ...... | ...... | ...... | ...... | 2.65 | ...... | ...... | ...... | ...... |
| West Point | 3.16 | 4.80 | 1885 | 1.70 | 1889 | 4.27 | 6.45 | 1873 | 1.90 | 1889 | 4.06 | 9.55 | 1889 | 1.50 | 1884 |
| Fremont | 2.98 | 5.49 | 1885 | 1.38 | 1887 | 3.46 | 5.23 | 1883 | 1.40 | 1884 | 4.27 | 7.61 | 1882 | 2.60 | 1887 |
| Yutan | 3.80 | ...... | ...... | ...... | ...... | 5.66 | ...... | ...... | ...... | ...... | 2.99 | 8.66 | 1884 | 2.32 | 1885 |
| Clear Creek | 2.19 | 5.00 | 1877 | 0.38 | 1880 | 4.51 | 10.88 | 1877 | 1.25 | 1876 | 5.75 | 10.35 | 1878 | 2.00 | 1876 |
| Weston | 1.78 | ...... | ...... | ...... | ...... | 3.00 | ...... | ...... | ...... | ...... | 5.36 | ...... | ...... | ...... | ...... |
| Ashland | 2.73 | 4.25 | 1885 | 1.29 | 1889 | 4.68 | 5.88 | 1888 | 2.93 | 1889 | 4.67 | 5.63 | 1889 | 3.34 | 1886 |
| Omaha Agency | 3.25 | 3.56 | 1869 | 1.02 | 1868 | 4.34 | 7.70 | 1873 | 1.50 | 1868 | 2.95 | 6.30 | 1873 | 0.50 | 1871 |
| Decatur | 1.09 | ...... | ...... | ...... | ...... | 3.24 | ...... | ...... | ...... | ...... | 4.79 | ...... | ...... | ...... | ...... |
| Fontanelle | ...... | ...... | ...... | ...... | ...... | 3.00 | ...... | ...... | ...... | ...... | 6.20 | ...... | ...... | ...... | ...... |
| De Soto | 2.59 | 5.04 | 1877 | 0.47 | 1880 | 4.84 | 8.20 | 1867 | 1.39 | 1887 | 4.72 | 8.58 | 1869 | 1.62 | 1886 |
| Omaha | 3.16 | 6.34 | 1885 | 0.55 | 1880 | 4.35 | 11.29 | 1883 | 0.30 | 1869 | 5.62 | 12.70 | 1883 | 0.50 | 1870 |
| Bellevue | 2.21 | 4.35 | 1858 | 0.45 | 1860 | 3.81 | 7.80 | 1873 | 1,32 | 1864 | 8.73 | 7.70 | 1874 | 0.82 | 1862 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Culbertson | 2.66 | 2.90 | 1888 | 2.43 | 1889 | 3.54 | 4.79 | 1888 | 2.28 | 1889 | 2.17 | 2.49 | 1889 | 1.85 | 1888 |
| Stratton | 2.80 | | | | | 1.20 | | | | | 3.25 | | | | |
| Red Willow | 2.28 | 3.04 | 1886 | 1.47 | 1884 | 3.93 | 6.48 | 1888 | 2.00 | 1889 | 3.44 | 4.98 | 1883 | 2.28 | 1884 |
| Richmond | 2.16 | 2.75 | 1876 | 1.56 | 1875 | 3.66 | 3.82 | 1875 | 3.50 | 1876 | 2.30 | 3.12 | 1876 | 1.47 | 1875 |
| Ravenna | 2.78 | 4.55 | 1888 | 2.08 | 1889 | 2.99 | 4.55 | 1888 | 1.43 | 1889 | 3.02 | 4.02 | 1889 | 2.01 | 1888 |
| Beaver Creek | 2.90 | 3.41 | 1885 | 2.60 | 1883 | 4.31 | 6.87 | 1882 | 2.97 | 1885 | 2.91 | 4.44 | 1883 | 1.57 | 1886 |
| Gibbon | 2.15 | | | | | 2.95 | | | | | 1.50 | | | | |
| Fort Kearney | 2.31 | 7.86 | 1849 | 0.20 | 1861 | 4.78 | 10.74 | 1849 | 0.48 | 1860 | 3.60 | 9.93 | 1850 | 0.49 | 1867 |
| Keene | 3.44 | 4.12 | 1884 | 2.75 | 1885 | 3.22 | 4.22 | 1884 | 2.23 | 1885 | 1.36 | 2.41 | 1885 | 0.30 | 1884 |
| Minden | 4.56 | 8.00 | 1888 | 1.40 | 1884 | 5.45 | 6.50 | 1883 | 3.45 | 1884 | 4.60 | 7.75 | 1888 | 2.35 | 1882 |
| Franklin | 1.68 | 2.09 | 1889 | 1.28 | 1888 | 4.64 | 5.28 | 1889 | 4.00 | 1888 | 3.62 | | | | |
| Rush | 2.69 | | | | | | | | | | 2.17 | | | | |
| Hastings | 3.19 | | | | | 3.43 | | | | | | | | | |
| Inavale | 4.79 | 6.80 | 1882 | 2.75 | 1884 | 5.28 | 6.60 | 1884 | 3.30 | 1883 | 5.13 | 6.75 | 1882 | 2.95 | 1884 |
| Red Cloud | 0.01 | | | | | | | | | | 7.65 | | | | |
| Marquette | 2.70 | 5.43 | 1885 | 1.60 | 1883 | 3.98 | 6.27 | 1886 | 1.61 | 1887 | 3.92 | 7.22 | 1887 | 1.58 | 1884 |
| Stockham | 3.98 | 7.20 | 1882 | 1.60 | 1886 | 5.31 | 10.55 | 1882 | 3.30 | 1885 | 4.20 | 9.00 | 1883 | 1.10 | 1884 |
| Harvard | 3.00 | | | | | 4.20 | | | | | 3.00 | | | | |
| Sutton | 8.65 | 10.95 | 1882 | 6.35 | 1883 | 9.56 | 14.18 | 1883 | 4.95 | 1882 | 4.35 | | | | |
| Superior | 3.33 | 3.70 | 1885 | 2.37 | 1883 | 4.27 | 5.75 | 1883 | 2.72 | 1884 | 2.52 | 3.62 | 1882 | 1.24 | 1884 |
| York | 3.83 | 4.56 | 1886 | 2.75 | 1884 | 3.33 | 6.50 | 1886 | 1.38 | 1884 | 5.12 | 7.87 | 1884 | 2.37 | 1886 |
| Fairmont | 3.52 | | | | | 2.00 | | | | | 0.82 | | | | |
| Seward | | | | | | 4.00 | | | | | 0.69 | | | | |
| Tamora | | | | | | | | | | | | | | | |
| Utica | 1.45 | | | | | 5.29 | | | | | 7.96 | | | | |
| Milford | 4.22 | 6.88 | 1882 | 1.57 | 1883 | 4.68 | 5.68 | 1883 | 3.67 | 1882 | 6.44 | 8.88 | 1883 | 4.00 | 1882 |
| Crete | 3.05 | 6.17 | 1882 | 0.90 | 1883 | 4.11 | 5.68 | 1887 | 1.79 | 1884 | 3.52 | 6.10 | 1885 | 1.39 | 1884 |
| De Witt | 4.23 | 6.50 | 1885 | 1.50 | 1888 | 4.49 | 7.40 | 1885 | 0.95 | 1884 | 6.66 | 11.30 | 1883 | 1.40 | 1884 |
| Plymouth | | | | | | 6.05 | | | | | 4.15 | | | | |
| Fairbury | 3.22 | 5.33 | 1885 | 1.81 | 1889 | 4.29 | 7.79 | 1889 | 1.73 | 1884 | 2.84 | 6.91 | 1888 | 0.61 | 1889 |
| Lincoln | 2.58 | 4.21 | 1882 | 0.53 | 1887 | 6.22 | 11.50 | 1881 | 2.84 | 1885 | 3.71 | 5.33 | 1881 | 1.07 | 1885 |
| Agricultural College | 2.79 | 4.20 | 1882 | 1.80 | 1883 | 4.18 | 6.12 | 1883 | 2.44 | 1884 | 12.08 | | | | |
| Cedar Bend | 7.19 | | | | | 3.37 | | | | | 10.89 | 15.42 | 1883 | 6.36 | 1882 |
| Glendale | 3.03 | 3.60 | 1868 | 2.52 | 1869 | 6.49 | 8.25 | 1867 | 2.85 | 1866 | 5.73 | 9.05 | 1869 | 3.15 | 1867 |
| Plattsmouth | 2.61 | 5.88 | 1877 | 0.11 | 1884 | 4.14 | 8.30 | 1883 | 1.25 | 1886 | 6.01 | 18.02 | 1874 | 0.65 | 1886 |
| Weeping Water | 2.67 | 5.21 | 1882 | 0.75 | 1883 | 4.13 | 6.75 | 1883 | 0.87 | 1881 | 4.46 | 14.63 | 1883 | 1.18 | 1885 |
| Palmyra | 4.65 | | | | | 4.80 | | | | | 3.59 | | | | |
| Syracuse | 2.67 | 4.30 | 1885 | 1.40 | 1883 | 5.06 | 8.09 | 1888 | 2.90 | 1884 | 5.34 | 15.35 | 1883 | 2.60 | 1884 |
| Emerson | 2.64 | 3.80 | 1876 | 1.70 | 1874 | 3.70 | 6.81 | 1873 | 1.55 | 1875 | 5.73 | 10.50 | 1875 | 2.87 | 1871 |
| Nursery Hill | 6.72 | | | | | 2.94 | | | | | | | | | |
| Nebraska City | 2.86 | 4.65 | 1886 | 1.63 | 1883 | 5.95 | 9.58 | 1871 | 2.80 | 1870 | 4.18 | 16.27 | 1883 | 1.00 | 1870 |
| Tecumseh | 2.91 | 4.90 | 1885 | 1.75 | 1888 | 6.24 | 8.23 | 1888 | 4.50 | 1885 | 4.32 | 5.06 | 1886 | 3.75 | 1885 |
| Table Rock | 2.87 | 4.23 | 1882 | 1.28 | 1883 | 2.62 | 3.64 | 1883 | 1.35 | 1884 | 7.32 | 17.02 | 1883 | 1.44 | 1884 |
| Pawnee City | 4.96 | 6.50 | 1882 | 3.41 | 1884 | 1.21 | | | | | | | | | |
| Mission Creek | 1.68 | 2.62 | 1886 | 0.64 | 1883 | 4.62 | 4.75 | 1885 | 4.50 | 1882 | 4.88 | 8.38 | 1886 | 1.37 | 1885 |
| Peru | 3.15 | 3.80 | 1882 | 2.50 | 1883 | 4.94 | 9.35 | 1883 | 1.15 | 1884 | 8.67 | 13.72 | 1883 | 5.84 | 1884 |
| Howard | 3.00 | 5.16 | 1877 | 1.08 | 1880 | 4.88 | 10.05 | 1877 | 2.40 | 1875 | 4.99 | 9.58 | 1878 | 2.10 | 1880 |
| Johnson | 2.97 | 5.35 | 1882 | 0.75 | 1883 | 6.55 | | | | | 16.20 | | | | |
| Brownville | 1.40 | | | | | 4.93 | | | | | 5.85 | 7.50 | 1885 | 3.93 | 1887 |
| Stella | | | | | | 4.64 | | | | | 13.26 | | | | |
| Dawson | 3.20 | 3.89 | 1885 | 2.50 | 1886 | 1.76 | 2.62 | 1885 | 0.89 | 1884 | 3.96 | 4.00 | 1885 | 3.93 | 1884 |
| Falls City | 3.01 | 4.32 | 1885 | 1.97 | 1888 | 4.29 | 6.58 | 1888 | 1.52 | 1884 | 4.99 | 7.87 | 1886 | 3.92 | 1889 |

## THE RAINFALL OF NEBRASKA—CONTINUED.

| NAMES OF STATIONS. | JULY. | | | | | AUGUST. | | | | | SEPTEMBER. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Av. | Maximum. | | Minimum. | | Av. | Maximum. | | Minimum. | | Av. | Maximum. | | Minimum. | |
| | *Ins.* | *Ins.* | *Years.* | *Ins.* | *Years.* | *Ins.* | *Ins.* | *Years.* | *Ins.* | *Years.* | *Ins.* | *Ins.* | *Years.* | *Ins.* | *Years.* |
| Fort Robinson | 1.73 | 2.67 | 1889 | 0.18 | 1883 | 1.80 | 3.32 | 1887 | 0.90 | 1886 | 0.59 | 1.05 | 1887 | 0.30 | 1886 |
| Camp Sheridan | 2.97 | 6.75 | 1878 | 0.41 | 1877 | 1.52 | 2.66 | 1880 | 0.66 | 1877 | 0.90 | 1.60 | 1876 | 0.30 | 1879 |
| Hay Springs | 2.38 | 3.09 | '86-'88 | 1.48 | 1887 | 3.40 | 3.55 | 1889 | 2.32 | 1886 | 0.38 | 0.78 | 1887 | 0.00 | 1888 |
| Valentine | 3.00 | 4.83 | 1888 | 2.04 | 1886 | 1.73 | 2.94 | 1887 | 0.34 | 1889 | 1.36 | 2.23 | 1885 | 0.66 | 1888 |
| Fort Niobrara | 2.31 | 3.27 | 1889 | 1.32 | 1886 | 1.41 | 2.66 | 1888 | 0.30 | 1882 | 1.40 | 2.56 | 1881 | 0.11 | 1880 |
| Kennedy | 2.02 | ...... | ...... | ...... | ...... | 1.28 | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Creighton | 7.88 | ...... | ...... | ...... | ...... | 1.28 | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Santee Agency | 2.50 | 4.20 | 1874 | 1.95 | 1872 | 2.08 | 2.60 | 1875 | 1.35 | 1871 | 1.31 | 2.70 | 1875 | 0.50 | 1873 |
| Neligh | 5.03 | ...... | ...... | ...... | ...... | 2.63 | 4.22 | 1885 | 1.04 | 1883 | 2.49 | ...... | ...... | ...... | ...... |
| Oakdale | 4.03 | ...... | ...... | ...... | ...... | 0.39 | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Ponca | 5.38 | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Gering | 2.14 | ...... | ...... | ...... | ...... | 1.27 | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Kimball | 2.20 | 2.79 | 1888 | 1.62 | 1889 | 1.68 | 1.97 | 1889 | 1.39 | 1888 | 0.02 | ...... | ...... | ...... | ...... |
| Fort Sidney | 2.50 | 8.78 | 1879 | 0.25 | 1877 | 1.91 | 3.79 | 1875 | 0.70 | 1878 | 1.33 | 4.01 | 1887 | 0.18 | 1879 |
| North Platte | 3.00 | 8.47 | 1879 | 0.68 | 1886 | 2.47 | 5.03 | 1877 | 0.16 | 1879 | 1.55 | 4.49 | 1877 | 0.08 | 1884 |
| Fort McPherson | 2.78 | 8.14 | 1879 | T | 1868 | 1.87 | 3.72 | 1867 | 0.40 | 1879 | 1.83 | 5.48 | 1870 | 0.00 | 1868 |
| Sargent | 3.96 | 5.63 | 1888 | 2.98 | 1883 | 2.42 | 3.04 | 1885 | 1.28 | 1889 | 1.29 | 2.15 | 1885 | 0.09 | 1884 |
| Ansley | 8.90 | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| North Loup | 10.37 | ...... | ...... | ...... | ...... | 1.58 | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Fort Hartsuff | 4.34 | 5.64 | 1880 | 1.46 | 1877 | 1.45 | 2.96 | 1880 | 0.64 | 1878 | 2.32 | 5.74 | 1876 | 0.68 | 1875 |
| Genoa | 4.45 | 7.45 | 1876 | 0.90 | 1877 | 2.45 | 4.60 | 1880 | 0.45 | 1881 | 3.35 | 11.34 | 1887 | 0.29 | 1888 |
| Palmer | 5.98 | 9.75 | 1889 | 2.20 | 1888 | 2.78 | 3.25 | 1888 | 2.30 | 1889 | 0.00 | ...... | ...... | ...... | ...... |
| Central City | 4.74 | 9.00 | 1884 | 1.85 | 1883 | 1.93 | 3.70 | 1885 | 0.00 | 1878 | 2.14 | 4.78 | 1884 | 0.19? | 1877 |
| Norfolk | 5.09 | 6.42 | 1876 | 2.35 | 1878 | 4.46 | 16.10 | 1875 | 0.28 | 1877 | 2.28 | 11.15 | 1883 | 0.35 | 1873 |
| Madison | 1.31 | ...... | ...... | ...... | ...... | 6.25 | ...... | ...... | ...... | ...... | 0.81 | ...... | ...... | ...... | ...... |
| West Hill | 3.69 | 5.32 | 1889 | 1.08 | 1885 | 2.72 | 3.55 | 1888 | 1.31 | 1889 | 1.91 | 3.18 | 1886 | 0.10 | 1888 |
| Stanton | 4.30 | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Stromsburg | 3.51 | 5.88 | 1884 | 1.95 | 1886 | 2.88 | 3.42 | 1886 | 2.41 | 1883 | 2.23 | 3.18 | 1886 | 1.48 | 1885 |
| Richland | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | 3.44 | ...... | ...... | ...... | ...... |
| Schuyler | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | 1.09 | ...... | ...... | ...... | ...... |
| David City | 4.98 | ...... | ...... | ...... | ...... | 1.70 | ...... | ...... | ...... | ...... | 0.00 | ...... | ...... | ...... | ...... |
| West Point | 4.68 | 7.18 | 1884 | 2.92 | 1888 | 5.18 | 8.95 | 1888 | 3.00 | 1889 | 1.77 | 3.25 | 1886 | 0.20 | 1888 |
| Fremont | 4.58 | 9.03 | 1884 | 1.07 | 1886 | 3.85 | 6.73 | 1884 | 0.83 | 1882 | 2.25 | 5.81 | 1884 | 0.37 | 1882 |
| Yutan | 4.75 | 9.19 | 1884 | 2.17 | 1886 | 5.22 | ...... | ...... | ...... | ...... | 5.06 | ...... | ...... | ...... | ...... |
| Clear Creek | 5.17 | 8.38 | 1878 | 1.00 | 1874 | 2.56 | 5.16 | 1883 | 0.16 | 1882 | 2.79 | 6.62 | 1874 | 0.47 | 1882 |
| Weston | 8.80 | ...... | ...... | ...... | ...... | 11.58 | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Ashland | 6.35 | 11.79 | 1884 | 1.06 | 1886 | 5.10 | 8.46 | 1889 | 2.30 | 1888 | 3.04 | 5.42 | 1886 | 0.21 | 1888 |
| Omaha Agency | 3.21 | 6.74 | 1872 | 2.00 | 1868 | 2.54 | 4.06 | 1869 | 1.53 | 1870 | 3.11 | 7.83 | 1869 | 0.40 | 1873 |
| Decatur | 4.23 | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Fontanelle | 9.40 | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | 6.22 | 11.40 | 1868 | 1.05 | 1863 |
| De Soto | 4.50 | 9.42 | 1876 | 0.70 | 1886 | 3.38 | 8.45 | 1875 | 1.03 | 1881 | 3.71 | 11.83 | 1870 | 0.38 | 1882 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Omaha | 5.81 | 17.01 | 1869 | 0.23 | 1870 | 3.99 | 13.11 | 1869 | 0.95 | 1882 | 3.49 | 8.76 | 1869 | 0.24 | 1888 |
| Bellevue | 4.37 | 15.85 | 1858 | 0.74 | 1864 | 2.45 | 11.20 | 1869 | 0.60 | 1873 | 3.33 | 6.60 | 1870 | 0.80 | 1873 |
| Culbertson | 3.65 | 6.18 | 1889 | 1.12 | 1888 | 2.30 | 2.97 | 1889 | 1.64 | 1888 | 0.97 | | | | |
| Stratton | 1.95 | | | | | | | | | | | | | | |
| Red Willow | 2.88 | 7.04 | 1884 | 1.04 | 1888 | 2.84 | 5.24 | 1884 | 1.16 | 1882 | 1.37 | 3.15 | 1883 | 0.12 | 1884 |
| Richmond | 5.04 | 8.78 | 1875 | 1.31 | 1876 | 7.59 | 8.12 | 1876 | 7.06 | 1875 | 1.81 | 2.34 | 1875 | 1.28 | 1876 |
| Ravenna | 7.02 | 8.75 | 1889 | 5.28 | 1888 | 2.92 | 4.22 | 1888 | 1.79 | 1889 | 1.76 | 3.05 | 1886 | 0.48 | 1888 |
| Beaver Creek | 4.82 | 6.34 | 1884 | 3.91 | 1886 | 3.47 | 5.86 | 1885 | 0.99 | 1882 | 1.58 | 3.75 | 1885 | 0.59 | 1884 |
| Gibbon | | | | | | 2.23 | | | | | | | | | |
| Fort Kearney | 4.66 | 8.50 | 1857 | 1.80 | 1859 | 2.47 | 6.05 | 1849 | T | 1867 | 2.27 | 4.60 | 1854 | 0.27 | 1849 |
| Keene | 6.18 | 6.60 | 1884 | 5.75 | 1885 | 3.60 | | | | | 1.20 | 1.60 | 1885 | 0.80 | 1884 |
| Minden | 8.45 | 13.20 | 1889 | 1.98 | 1883 | 3.91 | 9.50 | 1886 | 1.93 | 1883 | 2.61 | 3.20 | 1885 | 1.71 | 1882 |
| Rush | 7.43 | | | | | | | | | | | | | | |
| Hastings | | | | | | | | | | | | | | | |
| Inavale | 2.45 | | | | | | | | | | 2.00 | | | | |
| Red Cloud | 5.68 | 6.35 | 1872 | 5.00 | 1874 | 2.52 | 2.90 | 1874 | 2.13 | 1872 | | | | | |
| Marquette | 4.36 | 9.59 | 1889 | 1.59 | 1887 | 1.86 | 3.81 | 1888 | 0.03 | 1882 | 1.85 | 3.85 | 1886 | 0.13 | 1888 |
| Stockham | 4.25 | 5.70 | 1884 | 2.40 | 1886 | 5.15 | 7.75 | 1885 | 1.40 | 1882 | 1.65 | 1.85 | 1886 | 1.50 | 1885 |
| Harvard | 0.69 | | | | | 4.50 | | | | | 3.00 | | | | |
| Sutton | 7.20 | 7.76 | 1883 | 6.65 | 1882 | 4.56 | 7.96 | 1883 | 1.15 | 1882 | 2.06 | | | | |
| Superior | 5.58 | 7.87 | 1884 | 3.97 | 1885 | 2.13 | 3.37 | 1883 | 0.40 | 1882 | 1.71 | 2 00 | 1883 | 1.50 | 1884 |
| York | 4.75 | | | | | 2.76 | 3.13 | 1885 | 2.38 | 1886 | 1.92 | 3.43 | 1885 | 0.40 | 1886 |
| Seward | 4.81 | | | | | | | | | | | | | | |
| Utica | 2.75 | | | | | 1.64 | | | | | 1.42 | 1.43 | 1883 | 1.41 | 1882 |
| Milford | 4.93 | | | | | 0.50 | | | | | 1.00 | | | | |
| Crete | 4.03 | 7.25 | 1885 | 0.83 | 1886 | 3.42 | 6.56 | 1883 | 0.38 | 1882 | 1.82 | 3.21 | 1886 | 0.13 | 1888 |
| De Witt | 5.09 | 8.70 | 1884 | 0.10 | 1886 | 3.32 | 7.00 | 1885 | 0.50 | 1882 | 3.03 | 5.50 | 1886 | 1.40 | 1883 |
| Plymouth | 0.50 | | | | | 1.55 | | | | | 1.35 | | | | |
| Fairbury | 5.34 | 9.47 | 1884 | 0.49 | 1886 | 3.57 | 3.98 | 1888 | 1.01 | 1889 | 2.00 | 5.15 | 1886 | 0.25 | 1888 |
| Lincoln | 1.88 | 3.00 | 1888 | 1.33 | '81-'83 | 5.18 | 11.25 | 1883 | 0.25 | 1881 | 1.10 | 3.25 | 1881 | 0.08 | 1888 |
| Agricultural College | 2.42 | | | | | 6.04 | | | | | 2.32 | | | | |
| Cedar Bend | 5.70 | | | | | 4.13 | | | | | 0.88 | | | | |
| Glendale | 4.50 | 7.50 | 1869 | 2.80 | 1866 | 5.30 | 10.00 | 1869 | 1.70 | 1867 | 3.69 | 5.65 | 1866 | 1.55 | 1867 |
| Plattsmouth | 5.80 | 11.61 | 1878 | 1.10 | 1874 | 3.66 | 8.40 | 1875 | 1.00 | 1878 | 3.36 | 11.13 | 1874 | 0.60 | 1888 |
| Weeping Water | 4.51 | 7.62 | 1884 | 0.25 | 1886 | 5.16 | 11.05 | 1883 | 0.50 | 1882 | 2.77 | 5.87 | 1886 | 0.38 | 1882 |
| Avoca | 4.43 | | | | | 1.04 | | | | | 0.40 | | | | |
| Palmyra | 4.16 | | | | | 0.68 | | | | | 0.58 | | | | |
| Syracuse | 4.51 | 6.62 | 1885 | 1.86 | 1866 | 3.10 | 3.84 | 1889 | 2.56 | '85-'88 | 2.03 | 2.90 | 1884 | 0.26 | 1888 |
| Emerson | 6.28 | 14.20 | 1875 | 1.40 | 1877 | 1.90 | 3.90 | 1877 | 0.90 | 1874 | 3.28 | 6.03 | 1876 | 0.80 | 1873 |
| Nebraska City | 3.03 | 4.92 | 1884 | 0.71 | 1874 | 2.40 | 5.30 | 1884 | 0.30 | 1882 | 3.70 | 7.10 | 1870 | 0.07 | 1888 |
| Tecumseh | 5.04 | 9.03 | 1884 | 0.80 | 1887 | 4.76 | 12.10 | 1889 | 1.19 | 1886 | 2.57 | 4.87 | 1887 | 0.30 | 1888 |
| Table Rock | 5.67 | 7.45 | 1882 | 2.84 | 1883 | 1.62 | 1.85 | 1882 | 1.40 | 1883 | 0.66 | 0.71 | 1883 | 0.60 | 1882 |
| Pawnee City | 4.15 | 4.26 | 1882 | 4.04 | 1883 | 2.11 | | | | | 1.12 | 1.36 | 1883 | 0.87 | 1882 |
| Mission Creek | 7.75 | | | | | 1.25 | | | | | 5.32 | 6.63 | 1884 | 4.00 | 1886 |
| Peru | 3.92 | 4.25 | 1884 | 3.60 | 1882 | 2.50 | 3.50 | 1883 | 1.50 | 1882 | 1.88 | 3.25 | 1883 | 0.50 | 1882 |
| Howard | 4.54 | 10.21 | 1875 | 1.00 | 1881 | 3.14 | 6.09 | 1880 | 1.50 | 1881 | 4.76 | 12.36 | 1881 | 1.90 | 1877 |
| Johnson | 4.45 | | | | | 0.80 | | | | | 1.25 | | | | |
| Brownville | 2.65 | 3.00 | 1886 | 2.30 | 1887 | 2.93 | 3.74 | 1887 | 2.12 | 1886 | 5.86 | 6.36 | 1886 | 5.36 | 1887 |
| Dawson | 4.00 | | | | | 1.95 | | | | | 2.07 | | | | |
| Falls City | 3.86 | 7.01 | 1884 | 0.26 | 1886 | 2.93 | 5.45 | 1888 | 1.37 | 1886 | 2.48 | 5.26 | 1886 | 0.55 | 1888 |

## THE RAINFALL OF NEBRASKA—CONCLUDED.

| NAMES OF STATIONS. | OCTOBER. | | | | | NOVEMBER | | | | | DECEMBER. | | | | | YEAR. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Av. | Maximum. | | Minimum. | | Av. | Maximum. | | Minimum. | | Av. | Maximum. | | Minimum. | | Av. | Maximum. | | Minimum. | |
| | *Ins.* | *Ins.* | *Yrs.* | *Ins.* | *Yrs.* | *Ins.* | *Ins.* | *Yrs.* | *Ins.* | *Yrs.* | *Ins.* | *Ins.* | *Yrs.* | *Ins.* | *Yrs.* | *Ins.* | *Ins.* | *Yrs.* | *Ins.* | *Yrs.* |
| Fort Robinson | 2.45 | 8.60 | 1887 | 0.31 | 1886 | 0.77 | 1.70 | 1885 | 0.15 | 1884 | 0.85 | 1.97 | 1883 | 0.07 | 1888 | 16.66 | 25.25 | 1887 | 11.08 | 1886 |
| Camp Sheridan | 1.07 | 1.98 | 1877 | 0.50 | 1880 | 0.73 | 1.95 | 1876 | 0.05 | 1879 | 0.50 | 1.00 | 1880 | 0.20 | 1876 | 18.43 | 28.92 | 1878 | 12.46 | 1877 |
| Hay Springs | 0.66 | 1.45 | 1887 | 0.15 | 1888 | 0.92 | 2.19 | 1886 | 0.23 | 1887 | 0.84 | 1.61 | 1887 | 0.32 | 1888 | 20.81 | 22.90 | 1887 | 18.22 | 1886 |
| Valentine | 0.59 | 0.98 | 1885 | 0.27 | 1886 | 0.30 | 0.56 | 1886 | 0.13 | 1887 | 0.26 | 0.53 | 1887 | 0.10 | 1886 | 18.31 | 22.04 | 1888 | 13.98 | 1886 |
| Fort Niobrara | 1.20 | 2.90 | 1883 | 0.26 | 1886 | 0.29 | 0.68 | 1880 | T | 1882 | 0.77 | 1.60 | 1882 | 0.16 | 1888 | 18.77 | ...... | ...... | ...... | ...... |
| Santee Agency | 1.06 | 1.55 | 1872 | 0.25 | 1871 | 1.32 | 2.65 | 1871 | 0.60 | 1874 | 0.81 | 1.35 | 1873 | 0.40 | 1874 | 22.74 | 26.07 | 1873 | 17.81 | 1872 |
| Neligh | 1.06 | 1.27 | 1884 | 0.85 | 1885 | 0.72 | ...... | ...... | ...... | ...... | 0.66 | ...... | ...... | ...... | ...... | 23.03 | ...... | ...... | ...... | ...... |
| Oakdale | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | 0.55 | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Dakota City | ...... | ...... | ...... | ...... | ...... | 1.38 | ...... | ...... | ...... | ...... | 1.17 | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Kimball | 0.15 | 0.20 | 1887 | 0.10 | 1888 | 0.15 | 0.30 | 1887 | T | 1888 | 0.25 | 0.50 | 1887 | T | 1888 | ...... | ...... | ...... | ...... | ...... |
| Fort Sidney | 0.77 | 2.50 | 1877 | T | '76-'87 | 0.35 | 2.16 | 1875 | T | ...... | 0.24 | 0.64 | 1875 | 0.02 | 1872 | 14.48 | 26.92 | 1879 | 7.70 | 1886 |
| North Platte | 1.18 | 3.47 | 1883 | 0.13 | 1878 | 0.39 | 0.57 | 1874 | 0.01 | 1882 | 0.69 | 3.86 | 1877 | 0.09 | 1875 | 19.22 | 30.01 | 1883 | 11.84 | 1876 |
| Fort McPherson | 0.48 | 1.36 | 1874 | T | '67-'68 | 0.36 | 2.84 | 1871 | 0.00 | '70-'74 | 1.61 | 3.20 | 1877 | T | 1867 | 17.78 | 23.92 | 1868 | 10.08 | 1869 |
| Sargent | 0.64 | 1.00 | 1885 | 0.09 | 1884 | 0.53 | 1.50 | 1885 | 0.00 | 1888 | 1.35 | ...... | ...... | ...... | ...... | 22.69 | ...... | ...... | ...... | ...... |
| Ansley | ...... | ...... | ...... | ...... | ...... | T | ...... | ...... | ...... | ...... | 0.59 | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| North Loup | ...... | ...... | ...... | ...... | ...... | 0.40? | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| Fort Hartsuff | 1.38 | 3.82 | 1877 | T | 1878 | 0.28 | 1.04 | 1875 | T | 1877 | 0.57 | 2.22 | 1877 | T | '75-'78 | 20.78 | 23.58 | 1880 | 17.90 | 1878 |
| Genoa | 1.58 | 3.25 | 1883 | 0.25 | 1879 | 0.68 | 1.43 | 1886 | T | 1883 | 0.85 | 1.75 | 1883 | 0.00 | 1875 | 27.19 | 33.78 | 1887 | 16.93 | 1879 |
| Palmer | 1.00 | ...... | ...... | ...... | ...... | 0.00 | ...... | ...... | ...... | ...... | 0.60 | ...... | ...... | ...... | ...... | 21.70 | ...... | ...... | ...... | ...... |
| Central City | 1.91 | 4.45 | 1883 | 0.00 | 1879 | 0.50 | 1.00 | '85-'86 | 0.00 | '83-'84 | 0.80 | 1.10 | 1886 | 0.50 | 1883 | 24.57 | ...... | ...... | ...... | ...... |
| Norfolk | 0.84 | 2.20 | 1877 | 0.13 | 1878 | 0.76 | 2.05 | 1877 | 0.22 | 1878 | 0.33 | 0.55 | 1874 | 0.10 | 1876 | 27.84 | ...... | ...... | ...... | ...... |
| Madison | 0.75 | ...... | ...... | ...... | ...... | 0.75 | ...... | ...... | ...... | ...... | 0.48 | 0.60 | 1884 | 0.37 | 1885 | 23.88 | ...... | ...... | ...... | ...... |
| West Hill | 1.18 | 1.52 | 1886 | 0.85 | 1888 | 1.24 | 2.06 | 1886 | 0.10 | 1888 | 0.91 | 1.85 | 1884 | 0.21 | 1888 | 20.58 | 25.73 | 1886 | 18.58 | 1885 |
| Stromsburg | 2.50 | 3.98 | 1883 | 0.33 | 1886 | 0.63 | 1.28 | 1885 | 0.00 | 1883 | 0.71 | 1.12 | 1886 | 0.46 | 1884 | 30.08 | 34.92 | 1886 | 27.27 | 1884 |
| Richland | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | 0.35 | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| David City | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | T | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| West Point | 1.75 | 3.10 | 1884 | 0.70 | 1886 | 1.12 | 1.95 | 1885 | 0.30 | 1888 | 0.78 | 1.25 | 1884 | 0.50 | 1886 | 29.79 | ...... | ...... | ...... | ...... |
| Fremont | 2.11 | 3.81 | 1885 | 0.91 | 1888 | 0.77 | 1.92 | 1886 | 0.08 | 1888 | 1.55 | 2.52 | 1882 | 0.86 | 1883 | 29.89 | 39.94 | 1884 | 22.26 | 1887 |
| Yutan | 3.48 | 4.60 | 1884 | 2.36 | 1885 | 0.52 | 1.02 | 1885 | 0.02 | 1884 | 1.20 | 1.49 | 1885 | 0.91 | 1884 | 35.75 | ...... | ...... | ...... | ...... |
| Clear Creek | 2.42 | 5.46 | 1881 | 0.52 | 1878 | 0.96 | 2.26 | 1882 | 0.00 | 1875 | 0.86 | 2.13 | 1877 | 0.05 | 1876 | 30.59 | 39.24 | 1883 | 23.92 | 1880 |
| Ashland | 3.00 | 6.05 | 1884 | 1.14 | 1886 | 0.35 | 1.00 | 1886 | 0.06 | 1888 | 0.66 | 0.97 | 1888 | 0.50 | '83-'84 | 35.08 | 42.67 | 1884 | 27.58 | 1888 |
| Omaha Agency | 1.26 | 3.75 | 1872 | 0.34 | 1873 | 1.40 | 4.55 | 1871 | 0.10 | 1870 | 1.68 | 2.56 | 1869 | 0.53 | 1870 | 25.98 | 31.97 | 1869 | 18.79 | 1868 |
| Fontanelle | 1.00 | 1.10 | 1868 | 0.90 | 1863 | 2.42 | 2.50 | 1869 | 2.35 | 1863 | 2.10 | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... | ...... |
| DeSoto | 2.13 | 5.14 | 1881 | 0.46 | 1876 | 1.00 | 3.82 | 1871 | 0.06 | 1873 | 1.21 | 3.63 | 1869 | 0.13 | 1870 | 31.25 | 47.49 | 1869 | 19.94 | 1887 |
| Omaha | 2.77 | 5.86 | 1877 | 0.72 | 1887 | 1.38 | 4.25 | 1879 | 0.12 | 1888 | 1.20 | 5.51 | 1869 | 0.12 | 1872 | 34.81 | 48.92 | 1883 | 19.92 | 1887 |
| Bellevue | 1.93 | 6.03 | 1858 | 0.20 | 1862 | 1.05 | 3.20 | 1871 | 0.00 | 1870 | 1.52 | 6.40 | 1868 | 0.10 | 1870 | 29.06 | 33.75 | 1871 | 19.23 | 1860 |
| Culbertson | 0.83 | ...... | ...... | ...... | ...... | 0.25 | ...... | ...... | ...... | ...... | 0.05 | ...... | ...... | ...... | ...... | 21.82 | ...... | ...... | ...... | ...... |
| Red Willow | 1.47 | 3.92 | 1883 | 0.12 | 1882 | 0.12 | 0.28 | 1888 | 0.00 | 1882 | 0.84 | 1.53 | 1883 | 0.12 | 1888 | 21.83 | 26.01 | 1883 | 20.00 | 1888 |
| Richmond | 0.94 | ...... | ...... | ...... | ...... | 0.75 | ...... | ...... | ...... | ...... | 0.19 | ...... | ...... | ...... | ...... | 27.75 | ...... | ...... | ...... | ...... |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ravenna | 0.66 | 1.81 | 1888 | 0.00 | 1886 | 0.74 | 1.40 | 1886 | 0.09 | 1888 | 0.76 | 0.93 | 1886 | 0.60 | 1888 | 26.54 | | | | |
| Beaver Creek | 2.20 | 3.98 | 1883 | 0.97 | 1885 | 0.43 | 1.48 | 1885 | 0.04 | 1883 | 0.76 | 1.09 | 1884 | 0.37 | 1882 | 25.68 | | | | |
| Fort Kearney | 1.65 | 5.88 | 1857 | 0.00 | 1862 | 0.97 | 2.56 | 1857 | 0.08 | 1860 | 0.55 | 1.75 | 1865 | 0.00 | 1854 | 25.42 | 29.90 | 1853 | 16.10 | 1859 |
| Keene | 2.20 | 2.45 | 1884 | 1.95 | 1885 | 1.14 | | | | | 1.05 | 1.60 | 1885 | 0.50 | 1884 | 24.79 | | | | |
| Minden | 2.64 | 6.10 | 1882 | 0.15 | 1886 | 0.93 | 2.30 | 1886 | 0.10 | '82-'88 | 0.99 | 2.00 | 1885 | 0.17 | 1888 | 37.61 | | | | |
| Inavale | 2.20 | | | | | 0.60 | | | | | 0.20 | | | | | | | | | |
| Red Cloud | 0.30 | | | | | 0.00 | | | | | 0.35 | | | | | | | | | |
| Marquette | 1.70 | 3.23 | 1884 | 0.14 | 1886 | 0.38 | 0.81 | 1885 | T | '83-'88 | 1.47 | 6.05 | 1884 | 0.01 | 1888 | 24.73 | 31.66 | 1884 | 19.48 | 1888 |
| Stockham | 2.81 | 4.50 | 1882 | 0.20 | 1886 | 0.62 | 1.10 | 1886 | 0.10 | 1884 | 0.74 | 1.85 | 1885 | 0.25 | 1884 | 32.10 | 37.71 | 1883 | 28.55 | 1886 |
| Harvard | 4.00 | | | | | 1.50 | | | | | 1.75 | | | | | | | | | |
| Sutton | 4.40 | | | | | 0.20 | | | | | 2.05 | | | | | 45.17 | | | | |
| Superior | 3.33 | 5.87 | 1883 | 1.74 | 1884 | 0.70 | 1.13 | 1882 | 0 08 | 1884 | 1.44 | 2.05 | 1884 | 0.40 | 1883 | 28.48 | 32.13 | 1883 | 23.39 | 1882 |
| York | 0.72 | 1.37 | 1885 | 0.06 | 1884 | | | | | | | | | | | | | | | |
| Fairmont | 5.05 | | | | | 0.01 | | | | | | | | | | | | | | |
| Tamora | | | | | | | | | | | 0.52 | | | | | | | | | |
| Utica | 3.12 | | | | | 0.50 | | | | | 0.40 | | | | | 27.25 | | | | |
| Crete | 1.60 | 3.80 | 1884 | 0.71 | 1886 | 0.29 | 1.42 | 1887 | 0.02 | 1884 | 0.46 | 0.87 | 1887 | 0.19 | 1884 | 23.97 | 27.69 | 1886 | 22.81 | 1884 |
| De Witt | 3.15 | 6.00 | 1883 | 1.60 | 1886 | 0.65 | 1.00 | 1883 | 0.20 | 1884 | 1.18 | 2.00 | 1882 | 0.53 | 1886 | 35.41 | | | | |
| Plymouth | 0.25 | | | | | 0.50 | | | | | | | | | | | | | | |
| Fairbury | 2.48 | 6.27 | 1883 | 0.57 | 1887 | 0.35 | 0.50 | '83-'87 | 0.15 | 1888 | 0.65 | 0.97 | 1885 | 0.29 | 1888 | 28.92 | | | | |
| Lincoln | 1.62 | 4.25 | 1883 | 0.58 | 1882 | 0.81 | 1.50 | 1885 | 0.19 | 1888 | 0.91 | 1.50 | 1885 | 0.12 | 1886 | 27.[illegible]3 | | | | |
| Agricultural College | 6.03 | | | | | 0.56 | | | | | 0.56 | | | | | 39.72 | | | | |
| Cedar Bend | 2.63 | | | | | | | | | | 1.02 | | | | | | | | | |
| Glendale | 1.23 | 1.90 | 1868 | 0.75 | 1869 | 1.12 | 1.65 | '66 '68 | 0.05 | 1867 | 1.52 | 2.10 | 1868 | 0.85 | 1867 | 37.62 | 38.85 | 1868 | 29.51 | 1867 |
| Plattsmouth | 2.59 | 7.11 | 1877 | 0.71 | '76-'78 | 1.36 | 5.36 | 1879 | 0.00 | 1884 | 1.05 | 1.73 | 1877 | 0.06 | 1876 | 33.90 | 47.21 | 1875 | 17.52 | 1886 |
| Weeping Water | 2.96 | 6.00 | 188 | 1.27 | 1886 | 0.85 | 1.70 | 1882 | 0.06 | 1884 | 0.75 | 1.23 | 1886 | 0.00 | 1883 | 31.50 | 45.56 | 1883 | 25.75 | 1884 |
| Avoca | 3.40 | | | | | 1.91 | | | | | 1.95 | | | | | | | | | |
| Palmyra | 1.82 | | | | | 1.51 | | | | | 0.55 | | | | | | | | | |
| Syracuse | 3.25 | 5.65 | 1883 | 2.04 | 1888 | 0.76 | 1.51 | 1886 | 0.25 | 1884 | 0.66 | 1.00 | 1885 | 0.3[illegible] | 1883 | 30.68 | 40.23 | 1883 | 26.84 | 1886 |
| Emerson | 2.83 | 5.60 | 1877 | 0.70 | 1871 | 1.26 | 2.55 | 1871 | 0.00 | 1875 | 1.23 | 2.60 | 1877 | 0.27 | 1876 | 32.76 | | | | |
| Nebraska City | 3.11 | 7.07 | 1882 | 1.51 | 1874 | 0.90 | 2.27 | 1859 | 0.20 | 1870 | 0.64 | 1.21 | 1882 | 0.17 | 1870 | 30.[illegible]9 | | | | |
| Tecumseh | 2.41 | 3.23 | 1885 | 0.70 | 1887 | 0.59 | 0.80 | 1886 | 0.35 | 1888 | 0.89 | 1.50 | 1886 | 0.50 | 1885 | 33.83 | 35.92 | 1886 | 28.43 | 1887 |
| Table Rock | 3.14 | 4.23 | 1883 | 2.30 | 1884 | 0.43 | 0.49 | 1882 | 0.40 | '83-'84 | 0.62 | 1.17 | 1882 | 0.24 | 1883 | 26.83 | 32.84 | 1883 | 21.10 | 1884 |
| Pawnee City | 3.67 | | | | | 1.63 | | | | | 1.21 | | | | | | | | | |
| Mission Creek | | | | | | 0.38 | | | | | 0.53 | | | | | | | | | |
| Peru | 5.08 | 5.46 | 1883 | 4.70 | 1882 | 0.82 | 1.15 | 1882 | 0.50 | 1883 | 1.25 | 1.50 | 1882 | 1.00 | 1883 | 35.38 | 45.50 | 1883 | 30.33 | 1882 |
| Howard | 3.62 | 7.29 | 1877 | 1.72 | 1875 | 1.89 | 6.46 | 1879 | T | 1875 | 0.79 | 1.79 | 1877 | 0.10 | 1876 | 35.29 | 39.59 | 1877 | 27.40 | 1880 |
| Johnson | 4.15 | | | | | 0.50 | | | | | 0.26 | | | | | 39.73 | | | | |
| Brownville | 2.56 | 4.37 | 1886 | 0.75 | 1887 | 2.50 | 2.94 | 1886 | 2.07 | 1887 | 0.89 | 1.40 | 1886 | 0.38 | 1887 | 31.85 | | | | |
| Stella | | | | | | 0.85 | | | | | 0.28 | | | | | | | | | |
| Dawson | 4.80 | 6.33 | 1883 | 2.28 | 1885 | 0.66 | 1.05 | 1886 | 0.06 | 1885 | 0.96 | | | | | 27.55 | | | | |
| Falls City | 3.44 | 6.23 | 1883 | 1.71 | 1888 | 1.12 | 1.93 | 1888 | 0.30 | 1885 | 0.78 | 0.86 | 1886 | 0.68 | 1884 | 29.54 | | | | |

## GEOGRAPHICAL ARRANGEMENT OF STATIONS, GIVING THEIR LATITUDE, LONGITUDE, ELEVATION, NAME OF OBSERVER, AND LENGTH OF TIME OF RECORD.

| NAME OF STATION. | COUNTY. | LAT. | | LONG. | | ELEV. | RECORD. | | | | REMARKS AS TO OBSERVERS AND CHARACTER OF RECORDS. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Time. | | From. | To (inclusive). | |
| | | ° | ′ | ° | ′ | Feet. | Yr. | Mo. | | | |
| Fort Robinson | Dawes | 42 | 39 | 103 | 24 | | 5 | 2 | July, 1883 | August, 1889 | United States Post Hospital; missing September, 1883, and January to November, 1888, inclusive. |
| Camp Sheridan | Sheridan | 42 | 51 | 102 | 39 | | 4 | 8 | July, 1876 | March, 1881 | United States Post Hospital. |
| Hay Springs | Sheridan | 42 | 40 | 102 | 38 | | 3 | 8 | January, 1886 | August, 1889 | Wm. Waterman. |
| Valentine | Cherry | 42 | 50 | 100 | 32 | 2613 | 3 | 11 | September, 1885 | August, 1889 | Signal Service; missing October, 1888. |
| Fort Niobrara | Cherry | 42 | 46 | 100 | 25 | | 7 | | August, 1880 | August, 1889 | United States Post Hospital; missing April, June, July, October to December, 1881, inclusive; February, 1882; January, 1883; April, 1884, to December, 1885, inclusive; September, 1888. |
| Kennedy | Cherry | 42 | 30 | 100 | 53 | | | 7 | February, 1889 | August, 1889 | Mrs. M. G. Erickson. |
| Creighton | Knox | 42 | 27 | 97 | 48 | | | 9 | November, 1888 | August, 1889 | Geo. Roberts; missing February, 1889. |
| Santee Agency | Knox | 42 | 49 | 97 | 43 | | 4 | 3 | May, 1871 | September, 1875 | Geo. S. Truman; missing December, 1872, and November, 1873. |
| Neligh | Antelope | 42 | 7 | 97 | 59 | | 1 | 4 | August, 1883 | March, 1886 | B. R. Bucham, Nebraska Weather Service. H. E. Huxford; missing September and October, 1883; January to May, inclusive, August, September, November, and December, 1884; January to March inclusive; June and July, 1585. |
| Oakdale | Antelope | 42 | 4 | 94 | 57 | 1722 | | 9 | December, 1888 | August, 1889 | G. S. Clingman. |
| Ionia | Dixon | 42 | 40 | 96 | 48 | 3000 | | 2 | July, 1865 | August, 1865 | L. F. Hill. |
| Ponca | Dixon | 42 | 32 | 96 | 40 | | | 3 | May, 1880 | July, 1880 | J. Rockville. |
| Dakota City | Dakota | 42 | 25 | 96 | 25 | 1090 | | 6 | January, 1868 | January, 1869 | H. H. Brown; missing April to October, 1868, inclusive. |
| Gering | Cheyenne | 41 | 49 | 103 | 38 | | | 3 | June, 1889 | August, 1889 | Jno. P. Finley. |
| Kimball | Cheyenne | 41 | 3 | 103 | 40 | | 1 | 4 | October, 1887 | August, 1889 | W. G. Barton; missing February and March, 1888; January to May, 1889, inclusive. |
| Fort Sidney | Cheyenne | 41 | 9 | 102 | 59 | 4090 | 11 | 3 | June, 1872 | August, 1889 | United States Post Hospital; missing March, 1880; December, 1885; September to December, 1888. |
| North Platte | Lincoln | 41 | 8 | 100 | 45 | 2841 | 14 | 11 | October, 1874 | August, 1889 | Signal Service. |
| Fort McPherson | Lincoln | 41 | 0 | 100 | 3 | 2695 | 12 | 8 | December, 1866 | April, 1880 | United States Post Hospital; missing February to September, 1867, inclusive; November, 1876. |
| Sargent | Custer | 41 | 38 | 99 | 22 | | 2 | 11 | February, 1883 | August, 1889 | J. S. Spooner; missing September to December, 1883; February, March, August, and December, 1884; January to March inclusive, June and December, 1885; January, 1886, to March, 1888, inclusive; August, 1888; June and July, 1889. |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ansley | Custer | 41 | 15 | 99 | 22 | ......... | ...... | 9 | November, 1888 | July, 1889 | Peter Fowlie. |
| North Loup | Valley | ...... | ...... | ...... | ...... | ......... | ...... | 9 | November, 1888 | August, 1889 | M. B. C. True; missing December, 1888. |
| Fort Hartsuff | Valley | 41? | 43 | 99? | 0 | ......... | 5 | 8 | September, 1875 | May, 1881 | United States Post Hospital; missing November, 1878. |
| Genoa | Nance | 41 | 26 | 97 | 43 | 1584 | 15 | 9 | December, 1875 | August, 1889 | Geo. S. Truman. |
| Palmer | Merrick | 41 | 14 | 98 | 15 | ......... | 1 | 8 | January, 1888 | August, 1889 | C. Shieldstream. |
| Central City | Merrick | 41 | 4 | 98 | | 1708 | 4 | 10 | August, 1877 | December, 1886 | C. Shieldstream and Signal Service; missing September to December, 1877, inclusive; January to March, inclusive; September to December, 1878, inclusive; November and December, 1879; December, 1884; January and December, 1885; January and February, 1886. |
| Norfolk | Madison | 41 | 59 | 97 | 23 | 1532 | 1 | 3 | February, 1873 | July, 1884 | Louis Sessions. Nebraska Weather Service; missing July, 1873; October, 1873, to February, inclusive and July, 1874; December, 1875; October, 1876; December, 1877; January, 1879; March, 1879, to August, 1883; October, 1883, to January, 1884, inclusive; April and May, 1886. |
| Madison | Madison | 41 | 48 | 97 | 27 | 1589 | 1 | 1 | December, 1884 | December, 1885 | A. C. Tyrrel. |
| West Hill | Platte | 41 | 33 | 97 | 49 | ......... | 2 | 10 | December, 1884 | August, 1889 | J. L. Truman, Nebraska Weather Service; missing August, October, and December, 1885; May and July, 1886; March, 1887; January to June, 1888, inclusive. |
| Stanton | Stanton | 41 | 56 | 97 | 8 | 1486 | ...... | 3 | April, 1884 | July, 1884 | A. C. Tower, Nebraska Weather Service; missing June, 1884. |
| Stromsburg | Polk | 41 | 6 | 97 | 35 | 1636 | 3 | 2 | August, 1883 | December, 1886 | Nebraska Weather Service; missing September, 1884; March and December, 1885. |
| Richland | Colfax | 41 | 26 | 97 | 11 | 1350 | ...... | 8 | January, 1861 | September, 1871 | J. F. Bowen; missing April to November, 1861, inclusive; January, 1862, to December, 1867, inclusive; March, 1868, to December, 1869, inclusive; February, 1870, to August, 1871, inclusive. |
| Schuyler | Colfax | 41 | 26 | 97 | 3 | 1356 | ...... | 8 | September, 1883 | May, 1884 | Nebraska Weather Service, J. P. Sprecher; missing October, 1883. |
| David City | Butler | 41 | 15 | 97 | 6 | 1619 | ...... | 9 | September, 1888 | August, 1889 | J. R. Townsend; missing October and November, 1888; January, 1889. |
| West Point | Cuming | 41 | 50 | 96 | 42 | 1326 | 3 | 7 | April, 1873 | August, 1889 | Nathan H. Shaw; missing July, 1873, to March, 1884, inclusive; August, September, and November, 1884; February, August, and December, 1885; January, May, July, and November, 1886; year 1887; February and March, 1888. |
| Fremont | Dodge | 41 | 5 | 96 | 27 | 1203 | 7 | 5 | April, 1882 | August, 1889 | Isaac E. Heaton; Rev. L. F. Berry. |
| Yutan | Saunders | 41 | 19 | 96 | 23 | ......... | 1 | 10 | June, 1884 | January, 1887 | A. F. Bryant; missing August and September, 1885; April, May, June, and August to December, 1886, inclusive. |
| Tamora | Seward | 40 | 54 | 97 | 13 | 1559 | ...... | 2 | December, 1886 | February, 1887 | Nebraska Weather Service; missing January, 1887. |
| Utica | Seward | 40 | 57 | 97 | 13 | 1589 | 1 | 0 | September, 1882 | December, 1883 | John W. Jackman; missing October, November, and December, 1882; November, 1883. |
| Milford | Seward | 40 | 46 | 97 | 1 | 1414 | 1 | 1 | January, 1882 | June, 1883 | P. J. Hooker; missing October, 1882, to February, 1883, inclusive. |

GEOGRAPHICAL ARRANGEMENT OF STATIONS, ETC.—CONTINUED.

| NAME OF STATION. | COUNTY. | LAT. | | LONG. | | ELEV. | RECORD. | | | | REMARKS AS TO OBSERVERS AND CHARACTER OF RECORDS. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Time. | | From. | To (inclusive). | |
| | | ° | ' | ° | ' | Feet. | Yr. | Mo. | | | |
| Crete........................ | Saline ......... | 40 | 38 | 96 | 59 | 1368 | 7 | 2 | January, 1882 | August, 1889 | Signal Service, Dr. E. L. Childs, Prof. G. D. Swezey; missing May and September, 1882; January, May, June, and October, 1883. |
| De Witt..................... | Saline ......... | 40 | 23 | 96 | 54 | 1299 | 4 | 1 | March, 1882 | May, 1888 | F. C. Ware; missing September and November, 1882; March and December, 1883; March, August, and September, 1884; March, June, October, and December, 1885; April and August, 1886; year 1887; February, 1888. |
| Plymouth ................. | Jefferson....... | 40 | 15 | 97 | 0 | 1360 | ...... | 7 | May, 1873 | November, 1873 | W. F. Wier. |
| Fairbury .................. | Jefferson....... | 40 | 8 | 97 | 8 | 1316 | 5 | 2 | September, 1883 | August, 1889 | J. E. Humphrey, M. D.; missing August, November, and December, 1884; December, 1883; January and February, 1885; November and December, 1886; April, 1887; January, 1888. |
| Lincoln..................... | Lancaster..... | 40 | 48 | 96 | 40 | 1647 | 5 | 3 | April, 1870 | April, 1889 | Nebraska Weather Service; missing May, 1870, to January, 1881, inclusive; October, 1881; June, July, and August, 1882; March, April, June, and November, 1883; year 1884; January, February, March, and July, 1885; January to September, 1886; June to Sept., 1887, inclusive. |
| Agricultural College, (Lincoln) ............... | Lancaster..... | 40 | 48 | 96 | 40 | ......... | 1 | 1 | January, 1882 | May, 1884 | Nebraska Weather Service; missing May to December, 1882, inclusive. |
| Cedar Bend............... | Gage............ | 40 | 17 | 96 | 30 | ......... | 1 | 3 | January, 1882 | June, 1883 | T. B. Boggs; missing November, 1882; April and May, 1883. |
| Glendale ................... | Cass............. | 40 | 55 | 96 | 5 | 1300 | 3 | 6 | March, 1866 | October, 1869 | Dr. A. L. Child and daughter; missing June and October, 1866. |
| Plattsmouth............. | Cass............. | 41 | 0 | 95 | 50 | 983 | 12 | 10 | July, 1873 | August, 1889 | Dr. A. L. Child, H. B. Burgess; missing October, 1873; April, 1874; April, 1880, to February, 1882; May, 1883, to January, 1884; October, November, and December, 1888; January, Feb., and March, 1889. |
| Weeping Water......... | Cass............. | 40 | 53 | 96 | 8 | ......... | 6 | 2 | January, 1882 | August, 1889 | Garry Treat; missing July, 1882; January and February, 1885; year 1887; January, August, and September, 1888. |
| Avoca....................... | Cass............. | 40 | 48 | 96 ? | 6 | ......... | ...... | 6 | July, 1882 | December, 1882 | G. C. Clippen. |
| Palmyra.................... | Otoe ............ | 40 | 43 | 96 | 22 | 1150 | 1 | ...... | January, 1882 | January, 1883 | E. Griswold; missing February, 1882. |
| Syracuse................... | Otoe ............ | 40 | 39 | 96 | 9 | 1056 | 5 | 7 | January, 1883 | August, 1889 | P. W. Risser; missing August, 1886; year 1887. |
| Emerson................... | Otoe ............ | 40 | 40 | 96 | 0 | 1300 | 6 | 3 | June, 1871 | March, 1879 | Wm. Dunn; missing August and September, 1871; November and December, 1873; July and October, 1874; August, 1875; June, July, and August, 1876; April and May, 1877; April, May, and September to December, inclusive, 1878. |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nursery Hill............ | Otoe ............ | 40 | 39 | 96 | 13 | 1266 | ...... | 4 | February, | 1865 | May, | 1865 | R. O. Thompson. |
| Nebraska City.......... | Otoe ............ | 40 | 40 | 95 | 49 | 941 | 8 | 3 | May, | 1859 | July, | 1889 | J. B. Parmelee; missing January, 1860, to December, 1869; July, 1871; June, 1874, inclusive; November, 1874, to December, 1881; March and July, 1882; July to October, 1883, inclusive; October, 1884; July, 1885; July, 1886; year 1887; June, 1889. |
| Tecumseh.................. | Johnson ...... | 40 | 22 | 96 | 10 | 1113 | 6 | 0 | June | 1884 | August, | 1889 | W. L. Dunlap; missing February, March, and July, 1886. |
| Table Rock............... | Pawnee ...... | 40 | 10 | 96 | 4 | 1028 | 2 | 11 | January, | 1882 | May, | 1885 | Nebraska Weather Service; missing February, 1883; August and September, 1884; January, March, and April, 1885. |
| Pawnee City............. | Pawnee ...... | 40 | 6 | 96 | 8 | 1180 | 1 | 4 | January, | 1882 | May, | 1884 | A. K. Gowdy; missing March, May, June, and August, 1882; January to June, and October, and December, 1883; February, 1884. |
| Mission Creek.......... | Pawnee ...... | 40 | 2 | 96 | 22 | ......... | 1 | 11 | January, | 1882 | September, | 1886 | Nebraska Weather Service; missing April, June, and September, 1882, to March, 1883, inclusive; May to October, 1883, inclusive; April to August, inclusive, and October to December, inclusive, 1884; February to April, and July to December, 1885; May, June, July, and August, 1886. |
| Peru........................... | Nemaha...... | 40 | 28 | 95 | 43 | 1000 | 2 | 6 | January, | 1882 | July, | 1884 | Mary McKenzie; missing April, 1884. |
| Howard...................... | Nemaha...... | 40? | 30 | 95? | 56 | ......... | 6 | 8 | November, | 1874 | October, | 1881 | Chas. Blodgett; missing January and February, 1875; October, 1878; June, 1881. |
| Johnson..................... | Nemaha...... | 40 | 24 | 95 | 58 | 1230 | 1 | 5 | March, | 1882 | April, | 1884 | Nebraska Weather Service; missing May, 1882, to January, 1883, inclusive. |
| Brownville ................ | Nemaha...... | 40 | 24 | 95 | 40 | 894 | 2 | 1 | June, | 1885 | March, | 1888 | Geo. D. Carrington; missing July, 1885, to January 1886, inclusive; April and May, 1886. |
| Stella......................... | Richardson.. | 40 | 14 | 95 | 46 | ......... | ...... | 6 | May, | 1883 | February, | 1884 | Horace Martin; missing July to October, 1883, inclusive. |
| Dawson...................... | Richardson.. | 40 | 8 | 95 | 49 | 950 | 1 | 10 | October, | 1883 | December, | 1886 | E. C. Dawson; missing December, 1883; April, and July to December, 1884; January to March, and May to October, 1886, inclusive. |
| Falls City.................. | Richardson.. | 40 | 3 | 95 | 35 | 904 | 4 | 5 | August, | 1883 | August, | 1889 | Nebraska Weather Service; missing December, 1883; August, 1884; February, May, June, July, and December, 1885; January, 1886; year 1887. |
| Clear Creek............... | Saunders...... | 41? | 16 | 96? | 41 | 1150 | 9 | 8 | June, | 1874 | May, | 1884 | A. F. Bryant; missing April, 1881, and October, 1882. |
| Weston....................... | Saunders...... | 41 | 11 | 96 | 43 | 1260 | ...... | 5 | April, | 1889 | August, | 1889 | J. R. Campbell. |
| Ashland..................... | Saunders...... | 41 | 2 | 96 | 20 | 1100 | 4 | 5 | September, | 1883 | August, | 1889 | Geo. Shedd, Nebraska Weather Service; missing August, 1884; January, June, November, and December, 1885; August, and December, 1886; year 1887. |
| Omaha Agency.......... | Burt............ | 42 | 6 | 96? | 21 | ......... | 5 | 2 | January, | 1868 | October, | 1873 | W. Hamilton, S. O. Lee; missing August and September, 1868; July, 1869; February and April, 1870; March, 1871; January and December, 1872. |
| Decatur...................... | Burt............ | 42 | 0 | 96 | 13 | ......... | ...... | 5 | March, | 1869 | July, | 1869 | Dr. S. C. Case, |

## GEOGRAPHICAL ARRANGEMENT OF STATIONS, ETC.—CONCLUDED.

| NAME OF STATION. | COUNTY. | LAT. | LONG. | ELEV. | RECORD. | | | REMARKS AS TO OBSERVERS AND CHARACTER OF RECORDS. |
|---|---|---|---|---|---|---|---|---|
| | | | | | Time. | From. | To (inclusive). | |
| | | ° ′ | ° ′ | Feet. | Yr. Mo. | | | |
| Fontanelle.... .......... | Washington | 41 33 | 96 28 | 1000 | ...... 10 | September, 1863 | November, 1869 | H. Gibson, J. Evans; missing January, 1864, to December, 1867, inclusive; January to September, inclusive, and November and December, 1868; January, February, March, April, August, and October, 1869. |
| De Soto.................... | Washington | 41 28 | 96 3 | 1100 | 21 10 | May, 1867 | August, 1889 | Chas. Seltz; missing November, 1867; July, 1870; December, 1873; April, 1874; April and May, 1879. |
| Omaha .................... | Douglas...... | 41 16 | 95 56 | 1300 | 23 1 | June, 1857 | August, 1889 | Signal Service; W. H. Byers, J. G. Paine, J. F. Allen; missing October and November, 1858; year 1860; March, 1861, to February, 1869, inclusive. |
| Bellevue .................. | Sarpy.......... | 41 8 | 95 52 | ......... | 15 3 | March, 1858 | December, 1874 | H. Hamilton, E. E. Caldwell; missing December, 1859; January to April, 1863; February, 1864; August and November, 1865; March, and July to December, 1867, inclusive; January and February, 1868; March, 1869; May, 1872. |
| Culbertson................ | Hitchcock... | 39 28 | 100 48 | 2572 | 1 5 | April, 1888 | August, 1889 | Geo. D. Carrington. |
| Stratton................... | Hitchcock... | 40 9 | 101 13 | 2800 | ...... 5 | March, 1889 | July, 1889 | J. B. Slinn. |
| Red Willow............... | Red Willow, | 40 14 | 100 30 | ......... | 5 1 | June, 1882 | June, 1889 | Nebraska Weather Service; missing April to December, 1885, inclusive; October, 1886; December, 1887. |
| Richmond................ | Furnas......... | 40? 2 | 99? 56 | ......... | 1 6 | April, 1875 | September, 1876 | Henry W. Brown. |
| Ravenna................... | Buffalo......... | 41 2 | 98 54 | ......... | 1 11 | August, 1886 | August, 1889 | Erastus Smith; missing year 1887; January, 1888. |
| Beaver Creek........ ... | Buffalo ........ | 41? 0 | 98? 57 | ......... | 3 10 | January, 1882 | July, 1886 | Erastus Smith; missing February, April, and July, 1882; July and August, 1883; February and June, 1884; January and February, 1886. |
| Gibbon ..................... | Buffalo........ | 40 44 | 98 51 | 2067 | ...... 5 | March, 1884 | August. 1884 | Nebraska Weather Service; missing July, 1884. |
| Fort Kearney............ | Kearney...... | 40 38 | 98 57 | 2360 | 14 4 | March, 1849 | October, 1882 | United States Post Hospital; missing September, 1855; March, 1862; April to December, 1863, inclusive; January to November, 1865, inclusive; April, and June to December, 1866, inclusive; January to July, inclusive, and September to December, 1867, inclusive; February, 1868, to December, 1881, inclusive; February, 1882. |
| Keene....................... | Kearney...... | 40 25 | 99 4 | ......... | 1 11 | February, 1884 | December, 1885 | Nebraska Weather Service; missing August to November, 1884, inclusive. |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Minden** | **Kearney** | 40 | 29 | 98 | 57 | ........ | 4 | 9 | January, | 1882 | August, | 1889 | Joel Hull; missing June, September, October, and November, 1883; June and August, 1884, to June, 1885, inclusive; January, February, March, April, and July, 1886; year 1887; July and September, 1888. |
| **Franklin** | **Franklin** | 40 | 6 | 98 | 56 | 1820 | ...... | 11 | January, | 1888 | June, | 1889 | W. A. Harshbaran; missing June to December, 1888. |
| **Rush** | Franklin | 40 | 11 | 98 | 45 | ........ | ...... | 3 | April, | 1884 | July, | 1884 | Ira D. Cadman; missing May, 1884. |
| **Hastings** | Adams | 40 | 34 | 98 | 21 | 1947 | ..... | 7 | October, | 1883 | May, | 1884 | Aug. Rice; missing, December, 1883. |
| **Inavale** | Webster | 40 | 5 | 98 | 37 | 1729 | 2 | 1 | January, | 1882 | May, | 1885 | G. W. Knight; missing August and September, 1882; July, August, and October, November, and December, 1883; July, 1884, to March, 1885, inclusive. |
| **Red Cloud** | **Webster** | 40 | 5 | 98 | 31 | 1650 | 1 | 1 | **March,** | **1872** | **August,** | **1874** | J. H. & Edward Kellogg; missing April, May, and September, 1872; May, 1873, to June, 1874, inclusive. |
| **Marquette** | Hamilton | 40 | 58 | 98 | 0 | 1825 | 7 | 4 | May, | 1882 | August, | 1889 | John Ellis. |
| Stockham | Hamilton | 40 | 43 | 97 | 57 | ........ | 5 | 1 | January, | 1882 | April, | 1887 | Nebraska Weather Service; missing September and November, 1883; October 1885. |
| **Harvard** | Clay | 40 | 37 | 98 | 2 | 1812 | 1 | 3 | January, | 1885 | September, | 1887 | Marx F. Wastrom; missing March, June, and July, 1885; March, 1886, to April, 1887, inclusive, and August, 1887. |
| Sutton | Clay | 40 | 37 | 97 | 50 | 1689 | 1 | 7 | January, | 1882 | August, | 1883 | Dr. Martin Clark; missing June, 1883. |
| Superior | Nuckolls | 40 | 2 | 98 | 2 | 1574 | 3 | 4 | January, | 1882 | July, | 1885 | Nebraska Weather Service; missing March, 1882; September and December, 1883; November, 1884; January, February, and March, 1885. |
| **York** | York | 40 | 53 | 97 | 34 | 1642 | 1 | 6 | **May,** | **1884** | **October,** | **1886** | Nebraska Weather Service; missing August and September and December, 1884; January, March, July, August, October, and December, 1885; January, February, and March, 1886. |
| **Fairmont** | Fillmore | 40 | 38 | 97 | 33 | 1656 | ...... | 6 | October, | 1883 | June, | 1884 | W. A. Putney; missing December, 1883; February and March, 1884. |
| **Seward** | Seward | 40 | 53 | 97 | 5 | 1445 | ...... | 5 | February, | 1885 | July, | 1885 | H. McLain; missing April, 1885. |

# THE GRASSES AND FORAGE PLANTS OF NEBRASKA.

BEING THE ANNUAL REPORT OF THE BOTANIST, BY CHARLES E. BESSEY, PH. D.

*Gentlemen of the State Board of Agriculture:* I have the honor of submitting to you my annual report as your official botanist for the year 1889.

## I.—FIELD WORK.

During the year I made a short examination of the grasses and forage plants of the elevated region of the northwestern part of the state, particularly of Box Butte and Dawes counties. Incidentally a good many observations were made upon the vegetation of the region traversed in going to and returning from the counties particularly visited. Between Lincoln and Grand Island the ordinary cultivated grasses and clovers are abundantly grown. In Seward, York, and Hamilton counties I saw fine fields of red clover and timothy. Some of these were equal to any I have ever seen in any part of the United States. Beyond the Platte river the cultivated grasses decrease rapidly, the country being still quite new, but stray plants of clover and timothy seen here and there show that these will do well when the farmer once turns his attention to their growth. In Custer county fine fields of timothy and clover were seen.

Box Butte county is still so new that but little has been done in the way of introducing the cultivated grasses and forage plants, and thus far the wild grasses have been almost the only ones used for either hay or pasturage. A few fields of Hungarian grass or millet were seen in a drive of about thirty miles across the country from Alliance northwestward. The country here is an elevated plain upwards of 3,000 feet above the level of the sea. The surface of the ground is covered with close turf composed of Buffalo grass, Wheat grass, Gramma, and several others, which will be more particularly noticed in a subsequent portion of this paper.

In Dawes county, north of the Niobrara river, the surface becomes quite broken and upon Pine Ridge rises to an altitude of about 4,600 feet above sea-level. North of this ridge the surface descends abruptly to the valley of the White river. All over this mountain ridge there is a good turf of grass, including Buffalo grass, Gramma, Blue Stem, and Porcupine grass, the latter very abundant. A feature of Pine Ridge which is full of interest, although it does not bear directly upon the particular topic under discussion, is the considerable growth of pines in the canons and upon the ridges and slopes.

In the month of August I had occasion to visit Red Willow county, and while there took occasion to examine the grasses in the vicinity of Indianola and Bartley with some care. The valley of the Republican river here has an elevation of about 2,350 feet, while back upon the highlands the elevation is near to 2,500 feet above sea-level. In the valley the grass vegetation is exceedingly abundant, and includes all the well known wild grasses of the state, such as Buffalo grass, Gramma, Mesquite grass, Wild Wheat grass, Blue Stems, etc., etc. Along the river I found rank growths of the Great Reed grass (*Phragmites communis*), a grass of little agricultural value, but of marked interest to every one on account of its great size. Specimens collected at this time measured upwards of eight feet in height, showing that the climate is by no means as dry as has been supposed. Clover and timothy were observed in several fields, and in places fine growths of alfalfa, demonstrating the adaptability of this excellent forage plant to this soil and climate.

During the summer, Mr. Webber, my assistant in the botanical department of the University, made an extensive botanical tour through the counties of Custer, Thomas, Box Butte, Dawes, and Sioux, and, at my request, he gave especial attention to the native grasses of the regions he visited. His results will be given in a subsequent section.

In the autumn Mr. J. G. Smith, the assistant agriculturist of the Experiment Station, visited the counties of Box Butte and Cheyenne in order to study the native grasses. His results, which are valuable, are included in a subsequent section.

By this field work we have extended our knowledge of the native grasses of Nebraska very materially. Nearly, if not quite, one-half of the counties of the state have been personally visited and observations of greater or less importance have been made in them.

## II.—THE GRASSES OF CENTRAL NEBRASKA.

(*By Herbert J. Webber.*)

This summer [1889], while on a collecting trip for the Department of Agriculture in company with Lawrence Bruner, western entomological agent for the department, I spent several days on the Dismal and Loup rivers, in Thomas county, Nebraska. As this is in the very heart of the so-called barren sand hill region, a few notes especially on the Dismal river grasses may not be without interest.

We started for the Dismal river, of which we had heard much from the settlers, in the early morning of the 12th of July. We were accompanied by Mr. Wright, a farmer of the place (Thedford), and Mr. Harper, a sportsman. For several miles we drove up the valley of the Middle Loup river, here a stream about fifty feet wide, averaging three feet deep, and with a remarkably swift current (about eight miles an hour). The valley is usually about half a mile wide, and is the pasture and meadow region of the immediate country. The grass here is very rank; composed chiefly of Wheat grass (*Agropyrum glaucum* R. & S.), June grass (*Koeleria cristata* Pers.), Wild Rye (*Elymus canadensis* L.), Switch grass (*Panicum virgatum* L.), Prairie grass (*Eatonia obtusata* Gray), etc., intermixed with sedges, and in places with rank growths of several ferns (*Onoclea sensibilis* L., and *Aspidium thelypteris* (L.) Swartz.). The deer appreciate this rich pasturage, and even now frequently come down from the hills at night to enjoy it. Along the railroad up the valley I collected a bunch of Paspalum (*Paspalum setaceum* Michx.). It is evidently rare here, probably having but lately been introduced. I should not consider it a very valuable addition in an economic sense.

In some rather open places I observed bunches of Barley grass (*Hordeum nodosum*), Mr. Wright pronounces this grass worthless. In a prairie dog town in the valley, where the larger grasses are kept down, and the sod in places somewhat torn up and packed by the continual tramping, I found quite commonly bunches of the False Buffalo grass (*Munroa squarrosa* Torr.) and the common Stink or Candy grass (*Eragrostis major* Host.). The former I notice frequents such places and will likely become a "waste place" grass. At the edge of a little pond on the damp bank and extending into the water to where it was nearly a foot deep, the rare Mountain Water grass (*Catabrosa aquatica*) was discovered.

We soon left the bottom lands and began climbing the sand hills up over the divide. From all that I had heard of them I expected now a long, tedious ride, but not so. I was surprised at the great variety of flowers we found. We were kept constantly busy pointing out the different kinds and watching the flight of insects. At times we wearied our driver not a little by the frequency of our stops, although for a farmer he was quite a naturalist. The grasses on the sand hills are by no means so rare as one might suppose them to be judging by the common expression, "the barren sand hills!" The Gramma (*Bouteloua oligostachya* Torr.), Porcupine grass (*Stipa comata*), Little Blue Stem (*Andropogon furcatus*), Big Blue Stem (*Andropogon provincialis*), Sand grass (*Calamagrostis longifolia* Hook.), and the Wheat grass (*Agropyrum glaucum*) are, perhaps, the prevailing grasses. The last four are frequently quite badly rusted (*Puccinia graminis* Pers., which forms numerous little black or brownish powdery spots about the size of a pin head on the stems and leaves). The Prairie grass (*Sporobolus cryptandrus* (Trin.) Gr.) is in places quite common. Mr. Wright tells me that this is a fine pasture grass. It, also, is very frequently rusted (*Puccinia sporoboli* Arth.).

Our driver told us that we might look for antelope and deer on the divide, but although we saw numerous signs, perhaps fortunately for the scientific interest of our trip we could discover nothing more.

As we approached the divide the region became more hilly, and from here on till we reached the Dismal river grew constantly more undulating, until, with the sand and increasing heat, travel became very tedious. Mr. Bruner's hands, face, and neck were burned to a blister by the hot sun, and mine were no better. About two o'clock in the afternoon, much to our satisfaction, we suddenly emerged from the hills, and descended at first gradually, then abruptly into the valley of the Dismal river, our destination. We had ridden some twenty miles through sand hills, had seen but one house,—a deserted sod shanty,—and not a sign of water.

The appearance of Dismal river at this point is very striking. A half mile away one would never suspect the presence of more than a small "draw" at most, but soon one begins a rapid descent, and suddenly we look over a small bluff, and there below us a hundred feet spreads out the green valley of the Dismal river. A small valley, indeed, here only about seven hundred feet in width, but from its location the most interesting I have ever visited. Turn this way, and one sees only sand hill after sand hill, stretching away as far as the eye can reach, the air over them quivering with the heat of an almost tropical sun; face about, and there below is a green wooded belt, with underbrush in places forming almost a jungle, and, winding in and out, a clear, rippling stream. The coolness of the shaded valley seems to come rolling up in waves, enveloping the hot and tired collector as he gazes.

The bluffs on the south side of the valley rise abruptly to the height of almost three hundred feet. At one time they were heavily wooded with the red cedar (*Juniperus virginiana* L.), of which a few remain, but settlers for miles around depend upon this for their fuel and postwood. The brush from cut trees was thrown in rows, about a rod apart, extending up the bluffs, and a fire lately burned over great patches of this, doing much damage to standing trees, so that now from a distance the bluffs present a striking black and grayish-striped appearance.

Almost in the edge of the water rank stems of Water grass (*Glyceria arundinacea* Kunth.), three feet high, and with a panicle about sixteen inches long, were gathered. This is not a rare species in many places, but has not been noted before for Nebraska. Near this, and still in the edge of the water, we gathered specimens of the other smaller Water grass (*Glyceria nervata* Trin.), and the common Switch grass (*Panicum virgatum* L.).

In the woods specimens of Wild Rye (*Elymus striatus* Willd.) and Mountain Red Top (*Agrostis exerata* Trin.) were collected. A rather rare Water grass (*Oryzopsis micrantha* (Trin. & Rupr.) Thurb.) grew in the edge of a pond, and near it, on wet, sandy soil, Water Fox-tail (*Alopecurus geniculatus* L. var. *aristulatus* (Michx.) Torr.).

While walking along the edge of the bluffs on the south side to investigate the "blow-outs," we made some excellent finds. Right in the blow-outs where almost nothing else grew we found quite commonly bunches of Blow-out grass (*Redfieldia flexuosa* Vasey (Torr. Bull., July, 1887). Another somewhat rare Blow-out grass (*Eragrostis tenuis* (Ell.) Gray) was found to be quite common here. The former has heretofore been reported only from Colorado and Canadian river so far as I can ascertain; both were also found in Nebraska this summer near Valentine. Bunches of a Muhlenberg grass (*Muhlenbergia pungens* Thurb.) were also common, and are found usually hanging over just at the edge of the "blow-outs."

On the hillsides, patches of Buffalo grass (*Buchloe dactyloides* Engelm.) frequently occur. Bushy Blue Stem (*Andropogon nutans* L.), Western Beard grass (*Aristida purpurea* Nutt.), and bunches of Wire grass (*Schedonnardus texanus* Steud.) were gathered in quantity. A glaucous variety of the Switch grass (*Panicum virgatum* L. var. *glaucum* Vasey) is frequently met with here. It is smaller, covered with a whitish bloom, and has a more simple, less branched spike than the usual form. Down by the edge of the water, when on our road back, we noticed quantities of the Marsh Cord grass (*Spartina cynosuroides* (L.) Willd.). This is a common grass throughout the state, but is of no agricultural value. Other grasses were found, but these will suffice to show that "the sand hills" are not so barren as the name would indicate.

## III.—THE GRASSES OF NORTHWESTERN NEBRASKA.

(*By Herbert J. Webber.*)

During last summer (1889) I spent two weeks in botanical collecting at Belmont, on "Pine Ridge," Dawes county, Nebraska, from about July 15th to the 31st; and the week following in Harrison and Hat Creek basin, 20 miles northwest of Harrison, Sioux county. The whole of this northwestern region of Nebraska is mountainous, ranging in altitude, in Dawes county, from 3,900 feet in White river valley to about 4,900 or 5,000 feet on the bluffs of "Pine Ridge;" and in Sioux county from about 4,300 feet in the Hat Creek basin to about 5,200 feet on the highest points of "Pine Ridge." The flora of the two places, particularly the grass flora, is very similar, being mountainous in character. The prairie grasses here are similar to the upland grasses of the "sand hills," but the sod is more compact, indicating better adaptability and richer soil. It is difficult to tell what ones are the most common. Wheat grass (*Agropyrum glaucum* R. & S.), Porcupine grass (*Stipa comata*, Trin. & Rupr.), Sand grass (*Calamagrostis longifolia* Hook.), Big Blue Stem (*Andropogon provincialis* Lam.), Turkey-foot grass (*Andropogon hallii* Hack.), Little Blue Stem (*Andropogon scoparius* Michx.), Gramma (*Bouteloua oligostachya* Torr.), Salt grass (*Distichlis spicata* (L.) Green, var. *stricta* Thurb.), and June grass (*Koeleria cristata* Pers.) probably predominate and are the principal grasses of the uplands and unwooded valleys. In Hat Creek basin I examined the flourishing meadows of the Circle Bar ranch that are watered by irrigation, and found these grasses to make up the bulk of the hay. The grass on the prairie is usually quite light, but this irrigated meadow presented an agreeable contrast. It must not, however, be thought that the prairies are barren, for they are not. Thousands of cattle feed on "the range" now, as the myriads of buffaloes did before their extermination. Conditions are, however, changed. The Buffalo grass (*Buchloe dactyloides* Engelm.), that during the time of the buffalo is said to have been *the grass* of the prairie, is fast disappearing even in this western region.

Other grasses occur quite commonly and in some cases are quite valuable. The Switch grass (*Panicum virgatum* L.) is in some localities quite common, but is not so important a factor as it is in the central and eastern regions, but I think, that while this is said to be a valuable grass, in general, it does not figure very prominently anywhere in Nebraska, except, perhaps, in the eastern portion, where it has become in places a noxious weed. *Oryzopsis cuspidata* is common along roads and in open places, but is, I think, a worthless grass.

Bunches of Bunch grass (*Sporobolus asperifolius* (N. & M.) Thurb.), Beard grass (*Aristida purpurea* Nutt. and *A. purpurea* var. *hookeri* Tr.), Wire grass (*Schedonnardus texanus* Steud.), and Panic grass (*Panicum scoparium* Lam.) are usually scattered over the prairie; but as grazing grasses they are of but little value, being usually shunned by cattle in pastures. Bushy Blue Stem (*Andropogon nutans* L.) is a valuable grass and wide spread, but is seldom very thick on the ground, other grasses on the prairie seeming to crowd it out and hinder it from spreading.

The canons around Belmont are usually small, and are wooded with Pine, Box-elder, Cottonwood, Hackberry, etc. They are of but little use for grazing purposes, but furnish quite a number of interesting grasses. Oryzopsis (*Oryzopsis micrantha* (Trin. & Rupr.) Thurb.), Wild Chess (*Bromus kalmii* Gray and *B. kalmii* var. *porteri* Coulter), Hairy Brome grass (*Bromus ciliatus* L.), Brome grass (*Bromus breviaristatus* Thurb.), Wild Rye (*Elymus striatus* Willd.), and Muhlenberg's grass (*Muhlenbergia racemosa* (Michx.) B. S. P.) are found commonly in the woods of the canons. A few specimens, also, were collected of Oregon Blue grass (*Poa tenuifolia* Nutt.), Mountain Spear grass (*Poa andina* Nutt.), Blue grass (*Poa memoralis* L.), Eatonia (*Eatonia pennsylvanica* (Spreng.) Gray) and a wood Wheat grass (*Agropyrum tenerum* Vasey), growing in damp shaded places, but they are rare.

The canons of "Pine Ridge" in Sioux county, surrounding Hat Creek basin, are some of them large enough to furnish considerable pasturage. In some that were wet I walked through rank meadows containing chiefly Wheat grass (*Agropyrum glaucum* R. & S.), Yellow Top (*Calamagrostis stricta* Trin.), Red Top (*Agrostis alba*

L.), Mountain Red Top (*Agrostis exerata* Trin.), intermingled with other less common grasses, with sedges and rushes of various kinds. In all of these wet canons by the water's edge we find the pretty ribbed Water grass (*Glyceria nervata* (Willd.) Trin.). During the heat of the day cattle can retire to these canons for shade, and find also abundant pasturage and water.

## IV.—GRASSES OF BOX BUTTE AND CHEYENNE COUNTIES.

(*By Jared G. Smith.*)

August 21st I started from Alliance, Neb., on a short trip of observation to determine particularly the *grass flora* of southern Box Butte and northern Cheyenne counties.

Alliance lies on a broad level plain which appears to have been at one time the bed of a lake. Southward and eastward, from eight to ten miles distant, are the sand hills. To the west is the broad valley of Snake creek, a creek which, like nearly all the streams of this region, flows from the sand, rushes rapidly forward a few miles and disappears, losing itself in the sand. North and northwestward the land rises toward Pine Ridge. The only apparent outlet of this lake basin is toward the east in a pass through the sand hills.

On this level plain, parched and barren under the August sun, the principal grasses found were Gramma, *Bouteloua oligostachya* Torr., and its near relative *Bouteloua hirsuta* Lag.; Buffalo grass, *Buchloe dactyloides* Englm.; Wild Wheat grass, *Agropyrum glaucum* R. & S., and two others very common but of no agricultural value, a Beard grass, *Stipa sp.*—, near *comata* Trin., and Prairie Wire grass, *Schedonnardus texanus* Steud.

The great bulk of the prairie grass was Gramma, and I was told that it is *the* pasture grass of the region.

On the morning of August 21 I went in company with Mr. Nelson Fletcher, of Alliance, to a natural meadow of about 350 acres lying in the Snake creek valley just at the foot of the sand hills southeast of the town. The ground was wet but not swampy, and the rank plant growth which covered it formed a pleasing contrast with the sweltering sandy slopes around the meadow. The chief grass was *Agropyrum glaucum*, which differed from the form found near Lincoln in having longer and less harsh leaves. Mixed with it were *Andropogon scoparius* Michx., *A. provincialis* Lam., *Muhlenbergia glomerata* Trin., *Elymus canadensis* L., and *Panicum virgatum* L. With these grasses were tall golden rods, and purple blazing stars and white flowered asters, altogether making a brilliant flowery oasis in a sandy desert. The growth was very even, from two and one-half to four feet high. Mr Fletcher said though no hay is cut on the open prairie, enough is obtained from these natural meadows, and it is hay of very good quality, so that the average price ranges from two to four dollars per ton.

About a mile east of this meadow stood what appeared to be a large field of corn, but which on near approach proved to be Reed grass, *Phragmitis communis* Trin. This grass and cat-tails and rushes were quite common on the swampy meadows and around the numerous small lakes of the sand hill region.

Along the valley of Snake creek I found, in addition to those already mentioned,
*Andropogon nutans* L., bushy blue joint,
*Oryzopsis cuspidata* Benth., bunch grass,

*Sporobolus airoides* Torr., a small tumble weed,
*S. vaginæflorus* Vasey,
*S. asperifolius* N. & M.,
*S. asper* Kth.,
*Panicum capillare* L., old Witch grass,
*Setaria glauca* Beauv., Fox-tail,
*S. viridis* Beauv., green Fox-tail,
*Deyeuxia canadensis* Beauv., Sand grass,
*Distichlis maritima* Raf., Salt grass, and,
*Spartina cynosuroides* Willd., Cord grass,

In the sand hills around Alliance the principal grasses are:
*Andropogon hallii* Hack., Turkey foot,
*Sporobolus asper* Kunth.,
*Oryzopsis cuspidata* Benth.,
*Bouteloua oligostachya* Torr.,
*Deyeuxia canadensis* Beauv.,
*Eragrostis tenuis* Gray.
*Andropogon provincialis* Lam.,
*Andropogon nutans* L.,
*Andropogon scoparius* Michx.,
*Stipa comata* Trin., and on the higher hills and particularly noticeable at the edges of the "blow-outs," *Muhlenbergia pungens* Thurb.

In the clear white sand in the "blow-outs" *Redfieldia flexuosa* Vasey is found quite abundantly.

NOTES.—The best grazing grasses are Gramma and Buffalo grass.

Wild Wheat grass is good for hay but not for pasture.

*Sporobolus asperifolius* grows only in wet places.

The natural meadows yield one and one-half to two and one-half tons per acre,

The sand hill grasses are *Andropogon hallii*, *Deyeuxia canadensis*, with *Muhlenbergia pungens* and *Redfieldia flexuosa* about the "blow-outs."

I did not find sand-burs, but on sitting down to rest on a sandy knoll I found its place amply supplied by Mamillaria.

From Alliance I went west along Snake creek valley twelve or fifteen miles then southwest through the extreme western extension of the sand hills till I struck the old Black Hills trail at the head of Red Willow canon, and thence down the Red Willow southeast to the Platte. The only new find was *Munroa squarrosa* Torr., on the Platte side of the divide. *Oryzopsis cuspidata*, which at Alliance is found very sparingly, occurs quite abundantly in the Platte valley.

From Camp Clarke on the Platte I went south to Court House rock and Pumpkin creek. The rock is a great mass of argillaceous, light-brown sandstone which rises about 300 feet sheer above the level valley at its base.

The ridge stretching westward, of which Court House rock was once a part, at one time bore a forest of pine and red cedar. Now there are only some stumps and a few scattered trees to show what has been before. In the canons at the foot of Court House there were a number of woody shrubs and vines.

On the summit of the rock I found
*Oryzopsis cuspidata* Benth.,
*Agropyrum glaucum* R. & S.,

*Aristida purpurea* Nutt.,
*Bouteloua racemosa* Lag.,
*B. oligostachya* Torr.,
*Muhlenbergia pungens* Thurb., and *Sporobolus cuspidata.*
By the side of the creek at the base of the rock I found
*Eatonia obtusata* Gr.,
*Elymus canadensis* Linn.,
*Panicum virgatum* L.,
*P. crus-galli* L., and
*P. crus-galli* L., var. *hispidum* Gray,
*Aristida purpurea* Nutt.,
*Bouteloua oligostachya* Torr.,
*Munroa squarrosa* Torr.,
*Oryzopis cuspidata* Benth.,
*Sporobolus airoides* Torr., and
*Cenchrus tribuloides* L., sand-burs.

The sand-burs have probably been introduced in the Pumpkin creek valley in the wool of sheep which have been herded there.

NOTES.—I did not find *Munroa* north of the Platte valley.

I found *Andropogon hallii* only on the foot hills. These hills are sandy, but are not true "sand hills" as that name is applied in the West.

*Distichlis maritima!* is the chief pasture grass of the Platte valley around Camp Clarke.

Other grasses, *Buchloe dactyloides*, *Bouteloua oligostachya*, *Spartina cynosuroides*, *Agropyrum glaucum*, *Hordeum jubatum*, *Setaria glauca*, *S. viridis*, *Panicum crus-galli*, and *Munroa squarrosa* also occur, but they only form local patches, compared with *Distichlis.*

I visited from fifteen to twenty of the islands of the Platte and made two interesting finds. They were *Glyceria distans* Wahl. and *Sporobolus depauperatus* Torr.

The characteristic plant of these islands is the buffalo berry, a thorny, shrubby, tree, *Shepherdia argentea* Nutt.

## V.—GRASSES AT THE STATE FAIR.

At my request, Mr. Herbert J. Webber, my assistant in the department of botany in the University, made a careful examination of the collections of grasses at the State Fair held in September, 1889. He has prepared the following lists of the species included in the several collections:

### THE SOUTHEASTERN REGION.

#### LANCASTER COUNTY.

*Exhibitor, J. D. Woods, of Lincoln.*

Wild Rye (*Elymus canadensis* L.).
Wild Rye (*Elymus virginicus* L.).
Squirrel-tail grass (*Hordeum jubatum* L.).
Wheat grass (*Agropyrum glaucum* R. & S.).
Hairy Brome grass (*Bromus ciliatus* L.).

Sheep Fescue (*Festuca ovina* L.).
Stink or Candy grass (*Eragrostis major* Host.).
Eragrostis (*Eragrostis purshii* Schrad.).
False Red Top (*Eragrostis pectinacea* (Michx.) Gray).
June grass (*Koeleria cristata* Pers.).
Gramma (*Bouteloua oligostachya* Torr.).
Mesquite grass (*Bouteloua racemosa* Lag.).
Wood grass (*Cinna pendula* Trin.).
Hair grass (*Agrostis scabra* Willd.).
Prairie grass (*Sporobolus asper* (Michx.) Beauv.).
Prairie grass (*Sporobolus cuspidatus* Torr.).
Prairie grass (*Sporobolus vaginæflorus* (Torr.) Vasey).
Timothy (*Phleum pratense* L.).
Muhlenberg's grass (*Muhlenbergia racemosa* (Michx.) B. S. P.).
Muhlenberg's grass (*Muhlenbergia mexicana* (L.) Trin.).
Bushy Blue Stem (*Andropogon nutans* L.).
Big Blue Stem (*Andropogon provincialis* Lam.).
Green Fox-tail (*Setaria viridis* (L.) Beauv.).
Yellow Fox-tail (*Setaria glauca* (L.) Beauv.).
Barn-yard grass (*Panicum crus-galli* L.).
Old Witch grass (*Panicum capillare* L.).
Panic grass (*Panicum dichotomum* L.).
Switch grass (*Panicum virgatum* L.).

## NORTHEASTERN REGION.

### CUMING COUNTY.

*Exhibitor, Mr. Artman.*

Wild Rye (*Elymus canadensis* L.).
Wild Rye (*Elymus striatus* Willd.), a timber species.
Squirrel-tail grass (*Hordeum jubatum* L.). Very common. Worthless.
Wheat grass (*Agropyrum glaucum* R. & S.).
Brome grass (*Bromus ciliatus* L.)
Fescue grass (*Festuca tenella* Willd.).
Wire grass (*Poa compressa* L.).
Blue grass (*Poa pratensis* L.).
Orchard grass (*Dactylis glomerata* L.).
Stink grass or Candy grass (*Eragrostis major* Host.).
Eragrostis (*Eragrostis purshii* Schrad.).
June grass (*Koeleria cristata* Pers.).
Reed grass (*Phragmites vulgaris* (Lam.) B. S. P.).
Gramma (*Bouteloua oligostachya* Torr.).
Mesquite grass (*Bouteloua racemosa* Lag.).
Bristly Mesquite grass (*Bouteloua hirsuta* Lag.).
Wire grass (*Schedonnardus texanus* Steud.).
Sand grass (*Calamagrostis canadensis* (Michx.) Beauv.).
Hair grass (*Agrostis hiemalis* (Walt.) B. S. P.).

Prairie grass (*Sporobolus cuspidatus* Torr.).
Prairie grass (*Sporobolus asper* (Michx.) Beauv.).
Muhlenberg's grass (*Muhlenbergia diffusa* Schreb.).
Muhlenberg's grass (*Muhlenbergia racemosa* (Michx.) B. S. P.).
Porcupine grass (*Stipa spartea* Trin.).
Beard grass (*Aristida purpurea* Nutt.).
Canary grass (*Phalaris canariensis* L.).
Turkey-foot grass (*Andropogon hallii* Hack.).
Big Blue Stem (*Andropogon provincialis* Lam.).
Little Blue Stem or Red Stem (*Andropogon scoparius* Michx.).
Wild Rice (*Zizania aquatica* L.).

Sand Bur (*Cenchrus tribuloides* L.). When young, before the burs are formed, it is an excellent grazing grass.

Green Fox-tail (*Setaria viridis* (L.) Beauv.).
Yellow Fox-tail (*Setaria glauca* (L.) Beauv.).
Switch grass (*Panicum virgatum* L.).
Barn-yard grass (*Panicum crus-galli* L.).
Old Witch grass (*Panicum capillare* L.).
Small Panic grass (*Panicum scoparium* Lam.).
Crab grass or Finger grass (*Panicum sanguinale* L.).

## CENTRAL REGION.

### THOMAS COUNTY.

*Exhibitor, Mr. C. C. Wright.*

Wild Rye (*Elymus canadensis* L.). This is badly rusted (*Puccinia graminis* Pers.).

Wild Rye (*Elymus striatus* Willd.).
Squirrel-tail grass (*Hordeum jubatum* L.).
Barley grass (*Hordeum nodosum* L.).
Wheat grass (*Agropyrum glaucum* R. &. S.).
Wheat grass (*Agropyrum unilaterale* Vasey & Scrib.).
Hairy Brome grass (*Bromus ciliatus* L.).
Wild Chess (*Bromus kalmii* Gray).
Sheep Fescue (*Festuca ovina* L.).
Fescue grass (*Festuca tenella* Willd.).
Blow-out grass (*Redfieldia flexuosa* Vasey).
Water grass (*Glyceria arundinacea* Kunth.).
Ribbed Water grass (*Glyceria nervata* (Willd.) Trin.).
Mountain Spear grass (*Poa andina* Nutt.).
Salt grass (*Distichilis spicata* (L.) Green var. *stricta* Thurb.).
Candy grass or Stink grass (*Eragrostis major* Host.).
Blow-out grass (*Eragrostis tenuis* (Ell.) Gr.).
Mountain Water grass (*Catabrosa aquatica* (L.) Beauv.).
Prairie grass (*Eatonia obtusata* (Michx.) Gray).
June grass (*Koeleria cristata* Pers.). Very good hay when cut green.
False Buffalo grass (*Munroa squarrosa* Torr.).
Buffalo grass (*Buchloe dactyloides* Engelm.).

Gramma (*Bouteloua oligostachya* Torr.).

Mesquite grass (*Bouteloua racemosa* Lag.).

Wire grass (*Schedonnardus texanus* Steud.).

Sand grass (*Calamagrostis longifolia* Hook.).

Yellow Top (*Calamagrostis stricta* Trin.).

Red Top (*Agrostis alba* L.).

Hair grass (*Agrostis hiemalis* (Walt.) B. S. P.). (*Agrostis scabra* of previous reports.)

Prairie grass (*Sporobolus cusipdatus* Torr.).

Prairie grass (*Sporobolus cryptandrus* (Trin.) Gr.

Muhlenberg's grass (*Muhlenbergia mexicana* (L.) Trin.).

Muhlenberg's grass (*Muhlenbergia pungens* Thurb.). Valueless.

Muhlenberg's grass (*Muhlenbergia racemosa* (Michx.) B. S. P.) (*Muhlenbergia glomerata* of previous reports.)

Timothy (*Phleum pratense* L.).

Porcupine grass (*Stipa comata* Trin. & Rupr.).

Oryzopsis (*Oryzopsis cuspidata* (Nutt.) Benth.).

Water grass (*Oryzopsis micrantha* (Trin. & Rupr.) Thurb.).

Beard grass (*Aristida purpurea* Nutt.)

Water Fox-tail (*Alopecurus geniculatus* var. *aristulatus* (Michx.) Munro.).

Turkey-foot grass (*Andropogon hallii* Hack.).

Bushy Blue Stem (*Andropogon nutans* L.).

Big Blue Stem (*Andropogon provincialis* Lam.).

Little Blue Stem (*Andropogon scoparius* Michx.).

Cord grass (*Spartina cynosuroides* (L.) Willd.).

Old Witch grass (*Panicum capillare* L.).

Switch grass (*Panicum virgatum* L.). Mr. Wright calls this Broom Corn grass and informs me that it is quite a prevalent name.

Small Panic grass (*Panicum scoparium* Lam.).

Bead grass (*Paspalum setaceum* Michx.).

### CUSTER COUNTY.

*Exhibitors, Mr. Knight and Mr. Brown.*

Wild Rye (*Elymus canadensis* L.).

Squirrel-tail grass (*Hordeum jubatum* L.).

Wheat grass (*Agropyrum glaucum* R. & S.).

Hairy Brome grass (*Bromus ciliatus* L.).

Fescue grass (*Festuca tenella* Willd.).

Salt grass (*Distichlis spicata* (L.) Green, var. *stricta* Thurb.).

Stink or Candy grass (*Eragrostis major* Host.).

Prairie grass (*Eatonia obtusata* (Michx.) Gray).

June grass (*Koeleria cristata* Pers.).

Reed grass (*Phragmitis vulgaris* (Lam.) B. S. P.). This is the *Phragmitis communis* Trin. of previous reports.

Buffalo grass (*Buchloe dactyloides* Engelm.).

Gramma (*Bouteloua oligostachya* Torr.).

Bristly Mesquite (*Bouteloua hirsuta* Lag.).

Wire grass (*Schedonnardus texanus* Steud.). I am told that this is called "*Alkali grass*" in Custer county.

Prairie grass (*Sporobolus cryptandrus* (Trin.) Gr.).

Alkali grass (*Sporobolus arioides* (Steud.) Torr.).

Muhlenberg's grass (*Muhlenbergia racemosa* (Michx.) B. S. P.).

Porcupine grass (*Stipa comata?* Trin. & Rupr.).

Beard grass (*Aristida purpurea* Nutt.).

Bushy Blue Stem (*Andropogon nutans* L.).

Big Blue Stem (*Andropogon provincialis* Lam.).

Little Blue Stem (*Andropogon scoparius* Michx.).

Cut grass (*Leersia virginica* Willd.).

Wild Rice (*Zizania aquatica* L.). Not very common.

Cord grass (*Spartina cynosuroides* (L.) Willd.)

Sand Bur (*Cenchrus tribuloides* L.).

Yellow Fox-tail (*Setaria glauca* (L.) Beauv.).

Green Fox-tail (*Setaria viridis* (L.) Beauv.).

Old Witch grass (*Panicum capillare* L.).

Small Panic grass (*Panicum scoparium* Lam.).

Switch grass (*Panicum virgatum* L.). Very common.

Bead grass (*Paspalum setaceum* Michx.)

### HOWARD COUNTY.

*Exhibitors, Mr. N. Baxter, and Mr. Becker, of St. Paul.*

Wild Rye (*Elymus canadensis* L.). Very large.

Squirrel-tail grass (*Hordeum jubatum* L.).

Wheat grass (*Agropyrum glaucum* R. & S.).

Blow-out grass (*Redfieldia flexuosa* Vasey).

Mountain Spear grass (*Poa andina* Nutt.).

Candy grass or Stink grass (*Eragrostis major* Host.).

Blow-out grass (*Eragrostis tenuis* (Ell.) Gr.).

Reed grass (*Phragmitis vulgaris* (Lam.) B. S. P.). (This is the *Phragmitis communis* of previous reports.)

Gramma (*Bouteloua oligostachya* Torr.).

Bristly Mesquite grass (*Bouteloua hirsuta* Lag.).

Wire grass (*Schedonnardus texanus* Steud.).

Sand grass (*Calamagrostis longifolia* Hook.). Very large. Badly rusted (*Puccinia graminis* Pers.).

Meadow Tickle grass (*Sporobolus asperifolius* Torr.).

Prairie grass (*Sporobolus cryptandrus* Torr. & Gr.).

Prairie grass (*Sporobolus cuspidatus* Torr.).

Muhlenberg's grass (*Muhlenbergia racemosa* (Michx.) B. S. P.).

Turkey-foot grass (*Andropogon hallii* Hack.).

Big Blue Stem (*Andropogon provincialis* Lam.).

Little Blue Stem (*Andropogon scoparius* Michx.).

Bushy Blue Stem (*Andropogon nutans* L.).

Johnson grass (*Andropogon sorghum* Brot. sub. sp. *halepensis* (L.) Hack.). This is said to have escaped in places.

Wild Rice (*Zizania aquatica* L.). I find a smut on the leaf of this very common (*Ustilago lineata* Cke.).

Cord grass (*Spartina cynosuroides* Willd.). This is badly rusted (*Puccinia phragmitis* (Schum.) Korn.). It also has in the ovaries the stroma of the Ergot (*Claviceps purpurea*).

Sand Bur (*Cenchrus tribuloides* L.).
Green Fox-tail (*Setaria viridis* (L.) Beauv.)
Barn-yard grass (*Panicum crus-galli* L.). Large.
Crab or Finger grass (*Panicum sanguinale* L.).
Small Panic grass (*Panicum scoparium* Lam.).
Bead grass (*Paspalum setaceum* Michx.).

## SOUTHWESTERN REGION.

### CHASE COUNTY.

*Exhibitor, Mr. Bernard.*

Squirrel-tail grass (*Hordeum jubatum* L.).
Wheat grass (*Agropyrum glaucum* R. & S.).
Candy grass or Stink grass (*Eragrostis major* Host.).
Salt grass (*Distichlis maritima* (L.) Green, var. *stricta* Thurb.).
False Buffalo grass (*Munroa squarrosa* Torr.).
Buffalo grass (*Buchloe dactyloides* Engelm.).
Gramma (*Bouteloua oligostachya* Torr.).
Mesquite grass (*Bouteloua racemosa* Lag.).
Wire grass (*Schedonnardus texanus* Steud.).
Muhlenberg's grass (*Muhlenbergia racemosa* (Michx.) B. S. P.)
Muhlenberg's grass (*Muhlenbergia pungens* Thurb.).
Beard grass (*Aristida purpurea* Nutt.).
Turkey-foot grass (*Andropogon hallii* Hack.).
Big Blue Stem (*Andropogon provincialis* Lam.).
Old Witch grass (*Panicum capillare* L.).
Switch grass (*Panicum virgatum* L.).
Barn-yard grass (*Panicum crus-galli* L.).

### DUNDY COUNTY.

*Exhibitor, Mr. L. U. Parsons, of Max.*

Wild Rye (*Elymus canadensis* L.)
Wheat grass (*Agropyrum glaucum* R. & S.).
Salt grass (*Distichlis spicata* (L.) Green var. *stricta* Thurb.)
Candy or Stink grass (*Eragrostis major* Host.).
Prairie grass (*Eatonia obtusata* (Michx.) Gray).
False Buffalo grass (*Munroa squarrosa* Torr.).
Buffalo grass (*Buchloe dactyloides* Engelm.).
Gramma (*Bouteloua oligostachya* Torr.).
Mesquite grass (*Bouteloua racemosa* Lag.).
Bristly Mesquite (*Bouteloua hirsuta* Lag.).
Wire grass (*Schedonnardus texanus* Steud.).

Prairie grass (*Sporobolus cryptandrus* (Trin.) Gr.).
Prairie grass (*Sporobolus asper* (Michx.) Beauv.).
Muhlenberg's grass (*Muhlenbergia racemosa* (Michx.) B. S. P.)
Porcupine grass (*Stipa comata* Trin. & Rupr.).
Beard grass (*Aristida purpurea* Nutt.).
Turkey-foot grass (*Andropogon hallii* Hack.).
Bushy Blue Stem (*Andropogon nutans* L.).
Big Blue Stem (*Andropogon provincialis* Lam.).
Little Blue Stem (*Andropogon scoparius* Michx.).
Green Fox-tail (*Setaria viridis* (L.) Beauv.)
Old Witch grass (*Panicum capillare* L.).
Switch grass (*Panicum virgatum* L.).
Bead grass (*Paspalum setaceum* Michx.).

## VI.—NUMBER OF NEBRASKA GRASSES.

From a careful study of the plants in different parts of the state it is now certain that there are more than one hundred species of native Nebraska grasses. In the catalogue prepared by Mr. Webber, and accompanying this report (see Appendix) there are enumerated one hundred and six wild species, besides twenty-two which have been introduced purposely, or otherwise, by man and have subsequently "run wild" to a greater or less extent. I am aware that it has repeatedly been asserted that Nebraska contains one hundred and fifty species of grasses, and it may occasion surprise that we now, after so many years of further study, enumerate a good many less than that number. It must, however, be borne in mind that popularly all the sedges and many of the rushes are called grasses. Then, too, the clovers and clover-like plants are usually included under the name of grass. In this report only those are called by that name which are entitled to it in a botanical sense. Were we to add the plants of the other kinds mentioned above and all the proper grasses, grown only in fields, our Nebraska "grasses" would number from one hundred and seventy-five to two hundred kinds. However, from the botanical standpoint we must at present give the number at one hundred and twenty-eight. To this we may doubtless hope to add quite a number of species, as we are able to explore more fully all parts of the central and western regions of the state.

## VII.—VALUABLE WILD SPECIES.

It may be of use to growers of stock to know how many of the one hundred and thirteen wild grasses have any value as forage. I have taken some pains to examine the specimens and to make inquiries and think it is safe to say that from seventy-five to eighty species are of more or less value. They are as follows:

Wild Rye grasses.......*Elymus canadensis*, *E. canadensis* var. *glaucifolius*, *E. condensatus*, *E. sibiricus*, *E. striatus*, *E. virginicus*.
Wild Wheat grasses...*Agropyrnm glaucum*, *A. repens*, *A. tenerum*, *A. unilaterale*.
Wild Chess grasses.....*Bromus breviaristatus*, *B. ciliatus*, *B. erectus*, *B. kalmii*, *B. kalmii* var. *porteri*.
Fescue grasses..........*Festuca nutans*, *F. ovina*, *F. scabrella*, *F. tenella*.
Water grasses...........*Glyceria arundinacea*, *G. distans*, *G. nervata*.

| | |
|---|---|
| Blue grasses | *Poa andina*, *P. cæsia*, *P. debilis*, *P. nemoralis*, *P. serotina*, *P. tenuifolia.* |
| Salt grass | *Distichlis spicata.* |
| Wood grass | *Diarrhena americana.* |
| | *Melica porteri.* |
| Water grass | *Catabrosa aquatica.* |
| Prairie grasses | *Eatonia obtusata*, *E. obtusata* var. *robusta*, *E. pennsylvanica.* |
| | *Koeleria cristata.* |
| Reed grass | *Phragmites vulgaris.* |
| Purple grass | *Triodia seslerioides.* |
| Buffalo grass | *Buchloe dactyloides.* |
| The Grammas | *Bouteloua oligostachya*, *B. hirsuta*, *B. racemosa.* |
| Sand grasses | *Calamagrostis longifolia*, *C. canadensis*, *C. neglecta.* |
| | *Cinna pendula.* |
| Red Top grasses | *Agrostis canina*, *A. exarata*, *A. perennans.* |
| Prairie grass | *Sporobolus cryptandrus.* |
| | *Brachyelytrum aristosum.* |
| Muhlenberg grasses | *Muhlenbergia comata*, *M. diffusa*, *M. racemosa*, *M. mexicana*, *M. mexicana* var. *filiformis.* |
| Porcupine grasses | *Stipa comata*, *S. spartea*, *S. viridula.* |
| | *Alopcurus geniculatus*, *A. geniculatus* var. *aristulatus.* |
| Canary grass | *Phalaris arundinacea.* |
| The Blue Stems | *Andropogon hallii*, *A. nutans*, *A. provincialis*, *A. scoparius.* |
| | *Leerzia oryzoides*, *L. virginica.* |
| Wild Rice | *Zizania aquatica.* |
| | *Tripsacum dactyloides.* |
| Switch grass | *Panicum virgatum.* |
| | *Beckmannia erucæformis.* |
| | *Paspalum setaceum.* |

It must not be supposed that these are all of equal value, or that they are all of much value. I have admitted to the foregoing list all, or nearly all, that have any value whatever, either for pasture or for hay. Still there are some which I have rejected that have some value when cut early enough. Then, too, I have omitted all the introduced weedy grasses, many of which have some value for hay when cut at the proper time. These are so abundant, and grow without cultivation, that they might well be added to the foregoing list, bringing it up to nearly ninety species.

## VIII.—INTRODUCED GRASSES.

With the advent of white men, and the new conditions which they created, there came many plants which never before grew upon the plains. Some of these were brought to these new fields purposely, but many more came as weedy accompaniments of the farms, yards, gardens, wagon-roads, and railroads. In the following list I have included all the foreign species which I know to grow without cultivation in the state, and, in addition, those that are grown considerably in fields and meadows. I think it will surprise many a man when he learns that there are twenty-seven different kinds of foreign grasses which are already more or less common in the state, and that of this number no less than twenty-two are useful.

Indeed, under proper treatment, all but one (Stink grass, *Eragrostis major*) of the weedy species may be made into passable hay.

### 1. *Useful Foreign Grasses.*

RED TOP (*Agrostis alba* L. and *A. alba* L. var. *vulgaris*).—There are two kinds of Red Top growing in this state, distinguished mainly by a difference in the color of the heads. The first (*A. alba*) is usually of a light color with very little of that reddishness which is so marked in the second (*A. alba* var. *vulgaris*). The second is of more value than the first, and should be sown in preference to it.

Red Top, while starting late in the spring, affords good pasturage for the greater part of the season. (*Beal.*)

For damp or wet lands it is especially valuable, affording a fair crop of hay which has always been considered very desirable for feeding to horses.

MEADOW FOX-TAIL (*Alopecurus pratensis* L.).—This grass is rarely grown with us, but merits a trial upon Nebraska farms. It is likely to be of value upon irrigated lands. Another species (*A. geniculatus* L.), smaller in size, may ultimately have a considerable value in similar localities. Their earliness of appearance will commend them to stock-growers. They demand rich soils.

JOHNSON'S GRASS (*Andropogon sorghum* Brot. var. *halepensis*).—This large, coarse grass is extensively grown in the southern parts of the state. While tender in the north, it may still be grown with profit in many places. It endures droughts well and on that account will doubtless prove of great value to us in many seasons. It may be cut several times each season, and after each cutting it springs up promptly again. Frosts kill it entirely,.and so it is usually an annual in the North.

TALL OAT-GRASS (*Arrhenatherum avenaceum* Beauv.).—This tall grass has been tried with success in Nebraska, although not yet generally known to farmers. It is early in its growth, and therefore of great value to the grower of stock. In Kansas and Iowa, where extensive experiments have been made, it is pronounced one of our best farm grasses. In southern Nebraska it has been called "Evergreen grass."

BROME GRASSES (*Bromus* of several species).—Several kinds of Brome grasses are occasionally grown in this state by way of experiment. They are tall growing and yield a good deal of fodder.

ORCHARD GRASS (*Dactylis glomerata* L.).—Although Orchard grass is favorably known to many farmers in Nebraska, it is not as extensively grown as it deserves to be. It is one of the earliest grasses to appear, and it will furnish an abundance of pasturage long before the ordinary kinds grown on the farms. When cut early it makes a good hay, but if allowed to stand too long it is rather hard and wiry. In eastern and southern Nebraska it does well, as actual tests abundantly prove.

It is perfectly hardy in all parts of Nebraska.

FESCUE GRASSES (*Festuca* of several species).—Several kinds of Fescue grasses have attracted the notice of farmers in different parts of the country. One of the most favorably known is often called Randall grass, Evergreen grass, English Blue grass, or Tall Meadow Fescue. Botanically it is *Festuca elatior* L. It is of rather tall growth, and is somewhat coarse, but is well liked by domestic animals. On moist soils it does better than upon those which are drier.

RYE GRASSES (*Lolium multiflorum* Lam., and *L. perenne* L.).—These two grasses are well and favorably known abroad, and are grown somewhat in this country. The first is known as Italian Rye grass, and the second as Perennial Rye grass. Being short lived, they must be renewed frequently; in fact, for the most part, they have to be sown each year.

BARN-YARD GRASS (*Panicum crus-galli* L.).—Although usually regarded as a weed, Barn-yard grass may be made a valuable forage plant. It is a rank grower, and on rich soils will produce a great deal of hay. Being an annual, it must be treated as we do Hungarian grass, which it resembles in many ways.

TIMOTHY (*Phleum pratense* L.).—It is not necessary either to describe or to praise this excellent grass, whose value is conceded by all. That it will grow well in Nebraska needs no argument, and if there remain any doubters they have but to examine the grass collections at the annual State Fairs to have their doubts dissipated. In the eastern counties it is almost universally grown. Fine specimens from Thomas, Custer, Howard, Hitchcock, Furnas, and Box Butte counties attest its capability of growing freely in all parts of the state. It does best upon moist soils, and should not be sown on the uplands. The river valleys are admirably suited to its demands. In these it will endure for a long time, both for hay and pasture.

KENTUCKY BLUE GRASS (*Poa pratensis* L.).—Like the preceding grass, this one needs no words of praise from me. Its merits are admitted. As a grass for pasturage in the fore part of the season, and again in the latter part it stands unexcelled. Upon all the bottom lands of our river valleys it does well and is rapidly becoming the most important of the pasture grasses in the state. I predict that it will not be many years before we will be ready to hold a "Blue Grass Festival," as was done last year (1889) by the people of southern Iowa. Its universal use as a lawn grass in all our towns and cities is proof of its adaptation to the conditions of soil and climate found in Nebraska.

WIRE GRASS (*Poa compressa* L.). This resembles under-grown specimens of Kentucky Blue grass, and while it has a forbidding name it is nevertheless a good pasture grass. It will grow well on much drier soil than the preceding species.

MILLET (*Setaria italica* Kunth.).—There are many varieties of this widely grown grass. Those with small simple heads are known as Hungarian grass, while those with the larger and more compound spikes are usually called Millets of some kind. Under cultivation they have taken on many forms. In some the beards are well developed, producing a bristly hairy head, while in others the beards have disappeared, leaving the head smooth.

Few annual grasses have a higher value for Nebraska, especially in the newer portions of the state where permanent meadows have not yet been established. I have seen fine fields of it in all sections of the state, ranging in altitude from less than 1,000 feet above sea level to upwards of 4,500 feet.

### 2. *Weedy Foreign Grasses.*

CHESS OR CHEAT (*Bromus secalinus* L.).—Although not abundant, this weed in wheat fields has already obtained a foothold in Nebraska. In winter wheat regions for a long time it was supposed by some farmers that Chess was a kind of degenerated wheat; of course this was a mistake. Chess is a genuine plant of Nature's own building, and is not a degenerated state of any other.

While we call it a weed, it is nevertheless a nutritious plant, and if cut early enough (before the stem hardens too much) it makes very good hay.

STINK GRASS (*Eragrostis major* Host.).—This is called Candy grass by some people, though for what reason I cannot imagine. It has a peculiar fetid-pungent odor which is sufficiently disagreeable to animals to serve as a perfect protection to it. It is not eaten, and so thrives, and increases rapidly. About buildings, along roads and paths, and in waste places it is now quite abundant, although originally introduced from the old world.

CRAB GRASS (*Panicum sanguinale* L.).—In lawns and about buildings this is a common pest. I have seen it do much damage to young Clover and Blue grass upon lawns which were not yet well set. Like all the other weedy foreign grasses of this list, Crab grass is an annual and may be eradicated by care in sowing only clean seed and in cutting the grass before any seeds have ripened.

YELLOW FOX-TAIL (*Setaria glauca* Beauv.).—Too common to need extended notice. When cut early it makes a palatable hay. It is quite subject to a smut, which annually destroys much of the seed.

GREEN FOX-TAIL (*Setaria viridis* Beauv.).—This is distinguished from the former by its smaller grains and the greener color of the heads. It is even more common than the preceding species. While not affected by the smut which attacks Yellow Fox-tail this species is attacked by a downy mildew, which does it some harm.

## IX.—OTHER FORAGE PLANTS.

Observation shows that domestic animals eat more or less of the other vegetation than that belonging to the grasses found in every locality. While they undoubtedly depend more upon the grasses than upon other plants, a few of the latter have, under cultivation, a very high food value, as in the case of the clovers. In the wild state few of the plants not of the grass family have much value for food. Cattle will eat them, it is true, but the per cent of nutritive food in them is small.

### A.—*Wild Species.*

Under this head I will mention a few of the most important of the wild plants of this class eaten more or less by domestic animals.

*The Sedges* look so much like true grasses that they are commonly not distinguished from them by any but botanists. They may be told from grasses by their three cornered stems. They grow for the most part in wet or moist land, and often constitute a considerable per cent of the "slough hay" cut upon the prairies.

Sedges contain little nutritious matter and are an injury to either hay or pasturage.

*The Rushes* are of several kinds, and they vary in size from a few inches to several feet in height. While many of them bear some resemblance to the grasses, they possess little nutritious matter. They enter pretty largely into the composition of hay from the lower lands.

*Wild Leeks* are abundant in some parts of the state, and appear to be eaten readily by cattle in early spring. While they possess some nutritious matter, they are objectionable on account of giving a bad taste to the milk and butter of dairy cows.

*Cinque Foil.*—There are several native species of Cinque Foil, or Five Finger, which are common, and are eaten by animals, along with other forage.

*Wild Strawberry.*—The leaves of the Wild Strawberry are eaten by cattle, and doubtless constitute a food of some value.

*Wild Vetches* of several kinds belonging to the genera *Vicia* and *Lathyrus* are eaten to some extent. I presume that they have quite a little food value, as they are related to the Vetch of the Old World (*Vicia sativa*) which has been grown as a forage plant for ages.

*Loco Weeds.*—While these are not properly forage plants, unfortunately they are eaten pretty freely by domestic animals, greatly to their hurt. They belong to at least three genera of plants, viz.: *Astragalus*, *Oxytropis*, and *Crotalaria.* Of the first, the species which is most known as a Loco weed is *Astragalus mollissimus*, a silky-hairy plant eight to twelve inches in height, and bearing numerous root-leaves, each consisting of from nineteen to twenty-nine leaflets. *Oxytropis lambertii* is much like the preceding. Both are common in most parts of the state. *Crotalaria sagittalis* is found along the Missouri river bottoms, and is less hairy.

I need not stop here to describe the effects of Loco eating. They are too well known to need description.

*Wild Clovers* of a couple of species occur sparingly in the state. Wherever found they supply a good food for animals.

*Wild Sage* and other mints are occasionally eaten, probably with profit to the animal.

*Blazing Stars* of the genus *Liatris* supply an indifferent food to the animals which crop them.

*Thistles* of several species contain a considerable amount of food which occasionly is used by hungry animals.

### B.—*Cultivated Species.*

Popularly nearly all the forage plants not of the proper grass family are still called "grasses." Strictly speaking, none of the following list are grasses. They are "forage plants," and in some cases produce pasture and hay, but nevertheless they are not grasses in the proper meaning of the word.

Nearly all the plants grown on the farm are used more or less as forage by domestic animals. For example I might include pumpkins, potatoes, beets, turnips, apples, and other fruits, besides many others. But I have thought it inadvisable to discuss their merits, confining myself to those whose stems and leaves are eaten either in a green state, or when dried in the form of hay, or preserved as silage. Even with this restriction it is difficult to draw a line which is well marked between those to be included and those not to be.

RED CLOVER (*Trifolium pratense* L.). Of all the forage plants available there is none with more of promise in it for Nebraska than Red clover. It is already regarded as a necessity upon most farms in the eastern half of the state, and is fast becoming so for the newer, drier, and more elevated western half. No forage plant thus far grown in Nebraska excels Red clover in the quantity and quality of food produced by it per acre. Our soil is peculiarly adapted to its successful growth, and the sooner we give it the widest culture the better it will be for the agriculture of the state.

Red clover has been grown for a long time by our European ancestors, and is more popular now than ever. Dr. Stebler, in his excellent book on "The Best Forage Plants," says: "Red clover has contributed even more to the progress of agriculture than the potato itself, and has had no inconsiderable influence on European civilization. Its cultivation has led to an increased production of stock as food for man, and in this way has fostered and advanced commerce, industry, and science."

Aside from its value as a food for domestic animals, Red clover is one of the most useful crops for ameliorating and enriching the soil. The roots penetrate to a great depth, and in their decay upon subsequent plowing give to the soil a porosity and add nitrogenous elements which are greatly desired by the farmer. For rotative purposes Red clover is one of the very best of plants.

Red clover has become modified into a number of more or less well marked varieties, in fact many authorities consider that we have two distinct species. Dr. Hooker and George Bentham, both eminent English botanists, describe two species. Koch in the Flora of Germany, Hartman in the Scandinavian Flora, Lange in the Danish Flora, and in this country Gray, Wood, Watson, and others admit two species. The two are distinguished as follows in the late edition of Gray's Manual of Botany, p. 128:

1. *Trifolium pratense* L.—"Stems ascending, somewhat hairy; leaflets oval or obovate, often notched at the end and marked on the upper side with a pale spot; stipules broad, bristle pointed; heads ovate, sessile." This is the common, smaller sized Red clover.

2. *Trifolium medium* L.—"Stems zigzag, smoothish; leaflets oblong, entire, and spotless; heads mostly stalked; flowers deeper purple, otherwise too like the last." This is the Mammoth clover, also called the Giant clover.

Whether or not these are sufficiently distinct to be regarded as separate species I will not discuss at present, nor indeed is it particularly necessary that the matter should be decided. By means of the characters given above the farmer may readily tell whether he has the common or the Mammoth clover. The shape of the leaves, the presence or absence of the spot on the leaflets, and the stalked or stalkless heads will distinguish the two kinds.

Red clover is what is called a short-lived perennial, but in ordinary practice its life is little more than two years. Of course much depends upon the treatment it receives as well as upon the soil and climate, and it is perhaps yet too early to pronounce with certainty as to its duration in Nebraska. That it will prove to be more than a mere biennial I now predict with some confidence.

The seeds of Red clover vary much in color, some being yellow, others dark, while still others show a mixture of colors. They are very commonly mixed with various kinds of weed seeds. It has been repeatedly shown that many of the Eastern weeds have come to the West as adulterations of clover seed. On this account, if for no other, it is best for the Nebraska farmer to sow Nebraska-grown seeds. He will not be introducing foreign weeds at any rate.

In sowing clover seed it is better to use larger quantities per acre than is commonly done. According to Stebler there are 279,000 seeds in each pound of good clover seed. One pound would give, when sown, about six plants to each square foot. With six pounds these plants would be two inches apart every way. While with twenty-four pounds there would be one plant on each square inch. Put into tabular form this will appear as follows:

1 lb. per acre = plants about 5 inches apart.
6 " = " 2 "
10 " = " 1½ "
15 " = " 1¼ "
20 " = " 1⅛ "
25 " = " 1 "

Now let a proper allowance be made for poor seeds, which should not be less than one-tenth, while it must often be much more; then make an allowance for poor and uneven sowing, as well as for the inevitable death of many of the young plants, and it will be seen that it is necessary to sow much more than the amounts given above in order to have the plants occupy the ground with a particular closeness. Stebler recommends eighteen pounds per acre as a good average.

The *Dodder* of clover is one of the pests which is to be carefully watched. In Europe it is often very destructive. Stebler says of it in his book, "The Best Forage Plants," written for Switzerland, "Dodder is the enemy most to be dreaded." Thus far it has not appeared in great quantities in this part of the country. It has been reported from Missouri, Iowa, and some of the states to the eastward. I have recently examined one specimen of clover with a dodder upon it, found in southeastern Iowa, but while a dodder it turns out to be not the European pest (*Cuscuta epithymum* Murr.), but a small American species (*C. arvensis* Bey.) which bears much resemblance to it. Whether our American Dodder will eventually become a pest, of course cannot yet be told.

This American Dodder is a small slender vine of a pale yellow color, and having the thickness of an ordinary pin. It attaches itself firmly to the clover stalks by means of short suckers, making it almost impossible to pull it off without breaking. Its flowers are in clusters. They are white in color, and not much bigger than a pin head.

It will be a wise thing for the farmer to cut and burn up every patch of clover infested by this Dodder, first, however, sending me a specimen for examination.

WHITE CLOVER (*Trifolium repens* L.).—For pasturage this clover has valuable qualities which are too often overlooked by the stock grower. The ease with which it may be grown in the West, and especially in Nebraska, ought to commend it to the farmers of this state. Scatter a few seeds upon good soil, even if the wild grass still has possession, and it will not be long before the nutritious stems and leaves will make their appearance.

Stebler, the greatest authority on forage plants, says: "White clover is indispensable for the formation of pastures on low lying lands. It lasts for three or four years, and when the soil is good, even longer. Although the yield is less, it is superior in several respects to Red clover, *e.g.* (1) it thrives on soils of inferior quality; (2) it stands depasturing; (3) liquid manure is more suitable for it; (4) the nutritive value is higher, and (5) stock fed on it are not so liable to swelling (hoven). In pastures, and to a less extent in meadows, it is used for forming 'bottom grass.'" "It occurs wild [in Europe] in all good pastures; if abundant it is a certain indication of good land." "White clover is much less sensitive to climate than Red clover. Although its roots confine themselves mainly to the superficial layers of the soil, still drought is borne very well, because the axial tap-root descends further and absorbs water from the deeper layers."

The seeds are much smaller than in Red clover, there being no less than 740,000 in each pound, so that ten pounds will be ample for thoroughly sowing an acre.

ALSIKE CLOVER (*Trifolium hybridum* L.).—I am not prepared to speak of this clover with that confidence which I wish. I must confess to some doubt as to its great value in the West. I have seen several failures upon the prairies (in Iowa). Upon the Nebraska Experiment Station in 1888 it did "fairly well." In 1889 the agriculturist reports that "its chief value is the large amount of honey which bees get from it."

ALFALFA (*Medicago sativa* L.).—This plant, also called Lucerne, Chili clover, and French clover, is destined, in my opinion, to become one of the great forage plants of the central and western parts of Nebraska. That it is suited to our soil has already been well shown, and it only requires time to accustom our farmers to its culture. Under irrigation it produces in Colorado and western Nebraska several heavy crops of good hay. On the Nebraska Experiment Station it promises well.

BOKARA CLOVER (*Melilotus alba* Lam.).—This forage plant is frequently mentioned in agricultural journals, but I doubt its permanent value for the grower of stock. It is a well known and valuable honey-producing plant.

VETCHES OR TARES (*Vicia sativa* L.); COW PEAS (*Dolichos chinensis* L.); JAPAN CLOVER (*Lespedeza striata* H. & A.); KIDNEY VETCHES (*Anthyllis vulneraria* L.); SERRADELLA (*Ornithopus sativa*); SANFOIN (*Onobrychis sativa* L.), and LUPINES of various sorts (*Lupinus* sp.) are forage plants of considerable value in various countries, and it is likely that after enough experiments have been made some of them will be found to be useful in Nebraska. At present no one is warranted in purchasing heavily of the seeds of any of the foregoing with a view to their successful cultivation upon the plains. They may be successful, but if so the fact has not yet been demonstrated.

## X.—FOOD VALUES OF GRASSES AND FORAGE PLANTS.

Roughly speaking the food value of a grass depends upon the per cent of the albuminoids as shown by chemical analysis. The following table, compiled mainly from one made by Clifford Richardson, will serve as a general guide to the stock grower. The analyses were made upon the hay at ordinary stage of dryness:

| | Albuminoids. | Fat. | Non-Nitrogenous extract. | Fibre. | Ash. | Water. |
|---|---|---|---|---|---|---|
| Red Top (*Agrostis alba* var. *vulgaris*) | 9 | 3 | 48 | 20 | 6 | 14 |
| Johnson grass (*Andropogon Sorghum* var. *halepensis*) | 10 | 2 | 45 | 22 | 7 | 14 |
| Tall Oat-grass (*Arrhenatherum avenaceum*) | 10 | 2 | 43 | 24 | 7 | 14 |
| Orchard grass (*Dactylis glomerata*) | 8 | 3 | 47 | 21 | 7 | 14 |
| Randall grass (*Festuca elatior*) | 12 | 4 | 44 | 19 | 7 | 14 |
| Rye grass (*Lolium multiflorum*) | 10 | 3 | 48 | 17 | 8 | 14 |
| Barn-yard grass (*Panicum crus-galli*) | 7 | 2 | 43 | 24 | 10 | 14 |
| Timothy (*Phleum pratense*) | 7 | 3 | 48 | 24 | 4 | 14 |
| Kentucky Blue grass (*Poa pratensis*) | 10 | 3 | 46 | 21 | 6 | 14 |
| Wire grass (*Poa compressa*) | 9 | 3 | 49 | 19 | 6 | 14 |
| Millet (*Setaria italica*) | 8 | 2 | 48 | 21 | 7 | 14 |
| Red clover (*Trifolium pratense*) | 13 | 2 | 39 | 27 | 5 | 14 |
| White clover (*Trifolium repens*) | 15 | 4 | 35 | 26 | 6 | 14 |
| Alfalfa (*Medicago sativa*) | 15 | 3 | 28 | 34 | 6 | 14 |

## XI.—SOME GENERAL REMARKS ON CULTIVATION.

Some of the grasses and forage plants mentioned in the preceding pages require that the soil of the prairie should be thoroughly pulverized and mellowed before the seed is sown. This mellowing must extend deep enough so that the roots can readily penetrate to a good depth, and also, that the bottom moisture of the soil can readily find its way to the surface. The prairie soil before breaking the sod is very compact, and it requires several years of culture to mellow it sufficiently to serve as a good seed bed for many forage plants. It is generally much better to cultivate the ground for a couple of years, using such a crop as corn, then follow with Hungarian grass or Millet. By this time it ought to be ready for Red clover. If, however, such a crop as potatoes could be grown on the land it would mellow it still deeper. Buckwheat is a great mellower of the soil, too. What is necessary is that there should be a mellow condition of the soil to a great depth. It ought to be mellow "*all the way down.*"

Now with the ground in good condition, the Red clover may be sown with oats, wheat, barley, rye, or any other crop which will serve to shade the young plants. The crop must not be sown too thickly, lest the clover be choked out. Some people (especially in the older parts of the state) depend upon the weeds for the necessary shade, and do not sow anything with the clover. Timothy, Orchard grass, and Alfalfa generally require the same treatment as Red clover.

There are other forage plants which appear to do much better upon firm soils than upon those which have been made mellow. This is eminently the case with Kentucky Blue grass, and to a less degree with White clover. For these, and especially the former, it is desirable to firm the soil as much as possible in order that the young plants may find the conditions in which they grow best. This may be done by the use of a heavy roller, or by the tramping of stock.

In an instructive account of the method adopted by some Kentuckians to secure a good stand of Blue grass, Dr. Killebrew states in his book, "Grasses, Meadows, and Pastures," that the best plan is to sow with rye, wheat, or barley. After sowing grain, the land is to be harrowed, and, if possible, rolled. Then the grass seed is sown and brushed lightly, after which all the cattle, horses, and sheep which can be obtained are turned into the field to tread it down and make the soil compact. They are kept on the field until the soil is well packed. This treatment prevents the grass from drying up in the summer heats and droughts.

The practice is, then, not to allow stock upon the young pasture for a year, after which it will be so firmly established that it is likely to endure many years of reasonable pasturage.

In this state many men have had success in starting Blue grass pastures by going upon the unbroken prairie, and, after feeding down the wild grasses quite severely so as to weaken them, with a heavy harrow or cultivator scarifying the surface so as to offer places for the seeds to start. The seed is then sown upon the ground, or in some cases before the scarifying operation. Sometimes the farmer scatters over the surface the waste at the bottom of his mow of Blue grass hay, or the manure from animals fed on such hay. When properly done, in a favorable year the success of this method is unquestioned. Much the same method may be used for White clover.

## XII.—SEED TABLE.

In the following table I have given the legal weight of a bushel of good seed where it has been possible to find it, and the number of pounds of seed per acre recommended by Dr. Stebler. As to the latter it must be borne in mind that much depends upon the purity and germinating power of the seed. It rarely happens that more than 75 per cent of the seeds as bought of the dealers will grow. In the table allowance has been made for the average per cent of germination:

| | Pounds in a bushel.* | Pounds of average seed to be sown per acre. |
|---|---|---|
| Red Top (*Agrostis alba* var. *vulgaris*) | 8 to 32 | 9¾ |
| Orchard grass (*Dactylis glomerata*) | 12 to 16 | 35 |
| Randall grass (*Festuca elatior*) | 12 to 26 | 52 |
| Timothy (*Phleum pratense*) | 45 | 16 |
| Kentucky Blue grass (*Poa pratensis*) | 14 | 17½ |
| Red clover (*Trifolium pratense*) | 60 | 18 |
| White clover (*Trifolium repens*) | 60 | 10 |
| Alfalfa (*Medicago sativa*) | 61 to 63 | 25 |

*These weights vary with the cleanliness of the seed. Where much chaff adheres to the seed the weight is less. The figures given for Timothy, Blue grass, and clover are official for Nebraska, the others are on the authority of Stebler, for Europe.

## XIII.—FORAGE PLANTS UNDER IRRIGATION.

Three years ago I spoke as follows in my report: "I venture the assertion that ultimately a considerable portion of the area of cultivated soil in our western counties will be provided with facilities for irrigation. The rapid descent of the rivers, as they run down the great slope, is such that the construction of irrigating canals is rendered comparatively easy. Should this be accomplished, it would render possible the growth of forage crops such as we have never so much as dreamed of for amount. Red clover, Alfalfa, Timothy, and Blue grass and many others, now grown on the irrigated lands of Colorado, might then be grown in enormous quantities, two or three crops a year growing upon each field with but little trouble." Since then we have had a bulletin by Professor Hicks on "Irrigation in Nebraska," published by the Agricultural Experiment Station, in which it is shown that irrigation is possible along many of the streams of the state. Already the matter has taken shape, and we hear of irrigation companies in many parts of the state.

Allow me to repeat in this connection what I said three years ago, and to add that what I then said is doubly true now.

"For the successful prosecution of this work of the future we need to guard jealously the great mountain forests in Colorado and Wyoming, from which our rivers derive their supply of water. These Nebraska rivers are fed upon the snows which annually fall in heavy masses upon the Rocky mountains. If these mountains are covered with forests, the snows melt slowly, and so gradually give out their precious water to the streams as they flow over the great plains, giving to the soil a fertility like that of ancient Egypt. But if we allow the forests of the mountains to disappear, the snows will quickly melt before the early summer's suns, and by midsummer there will be only the sandy beds of the former great rivers of the plain.

"Gentlemen of this society, we cannot afford to sit still while this destruction of our wealth-giving rivers is going on. Every year thousands of acres of the mountain forests of Colorado and Wyoming are destroyed, and year by year our midsummer rivers are dwindling away. We owe it to ourselves, to our children, to our good state, to see that this heritage is not taken from us."

## XIV.—SOME DISEASES OF GRASSES.

In this brief preliminary note on this subject I will refer only to the diseases due to the attacks of parasitic fungi. From a hasty examination of the Catalogue of Nebraska Plants prepared by Mr. Webber it appears that the grasses have about forty different kinds of fungi which injure them. Fortunately not all occur on any one grass, but in some cases two, three, four, or even more, attack a single kind of grass.

*The Rusts* attacking grasses number no less than fifteen species. When abundant they do a good deal of harm by reducing the growth of leaf and stem. In looking at the wild grasses in order to judge of their merits with a view to cultivating them, it will be well to notice whether or not they are much infested with rusts.

So far as I know, the rusts are not in themselves harmful to the animals which eat rusted grass or hay.

*The Smuts.*— Of these about seventeen species attack various kinds of grasses. All are very harmful to the infested plants, particularly so as they most frequently destroy the flowers or seeds.

Whether they injuriously affect the animals which eat them has not yet been fully decided.

*The Mildews.*—A "Powdery Mildew" is quite common on many grasses, especially when they are closely grown, and in damp weather. Cattle do not relish such mildewed grass. A "Downy Mildew" is known to occur on one of the Fox-tail grasses, and I am told that it has been seen on Millet also. It turns the leaves yellow, and ultimately kills them.

*Leaf Spot.*— Several kinds of fungi bearing this name are very common on our grasses, and all do more or less harm. Without taking time now for a particular description, it may be said that all show themselves as spots upon the leaves and stems. In some species these spots are pale or white, while in others they are reddish, brownish, or even black. As the fungi causing these diseases are internal, nothing can be accomplished in the way of remedy by any external application of poisonous solutions. Should any patch of grass show much leaf-spotting, it may be well to thoroughly burn it over.

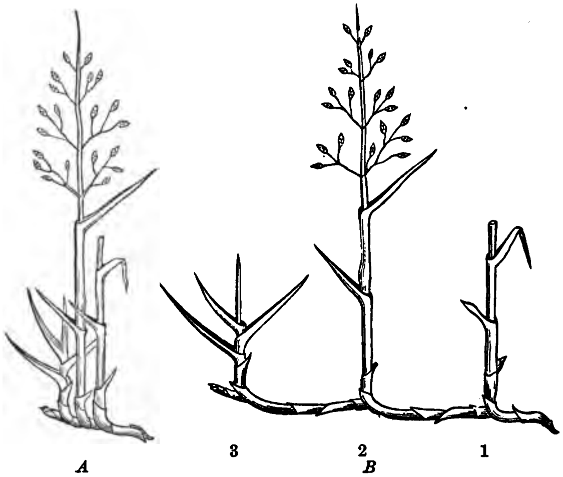
*Ergot.*— Some of the grasses are quite commonly affected by Ergot, rendering them more or less dangerous to domestic animals. It appears as a black, spur-like growth in place of the grain. It is common on rye, especially upon stray stalks growing at a distance from other rye plants. It occurs in abundance upon Wild Wheat grass, and Wild Rye. I once saw it in Ohio very badly affecting the heads of Blue grass. In Iowa I have seen it on Timothy.

Care should be taken not to make hay of any grass which happens to have much Ergot upon it, as it is known to produce abortion in pregnant animals. When abundant it produces a dangerous gangrene in cattle, sometimes causing them to slough off the lower joints of their feet.

## XV.—ON THE PRACTICAL STUDY OF GRASSES.

In the following paragraphs I propose to give, in as non-technical language as possible, the principal points in the structure of grasses which are necessary to be known in order to distinguish the more difficult species having agricultural interest.

It is well to look over the plant in the order given below, noting carefully the different points.



Diagrammatic figures of a perennial grass, showing the horizontal underground stem sending up shoots each season. In *A* this underground stem is short, while in *B* it is elongated. 1, is the last year's shoot; 2, the shoot of the present year, and 3, the young shoot of next year.

1. *The Underground Part.*—Let it be remembered that not every underground part is root. Many grasses have stems as well as roots under the ground.

The roots of grasses are usually fibrous, and grow from the base of the stem forming a dense cluster, as in Fox-tail and wheat, or they grow out from the sides of horizontal underground stems, where they may be scattering and few, or abundant and densely matted.

The underground stems are distinguished from roots by the fact that they are scaly. No root is ever scaly. These underground stems creep through the ground and send up stems to the surface at intervals, as shown in Figs. A and B. Kentucky Blue grass shows good examples of underground stems. A grass possessing underground stems is perennial, and if hardy, will usually make a dense sod, and endure close pasturage.

2. *The Stems.*—Grass stems are always jointed. In general they are round or roundish, and they are never triangular, by which fact they may be distinguished from the sedges, whose stems are *triangular.* The joints are enlargements of the stem at the places from which leaves grow; they are solid, having no hollow in the center, and they retain for a long time the power of bending, by which means a stem when bent over is able to right itself again.

The stem between the joints is usually hollow, as in Timothy, Kentucky Blue grass, wheat, oats, etc., but in the Blue Joints (*Andropogon*), Indian corn, cane, etc., it is solid. This character is one to be carefully noted in any examination. These structures are shown in the plate (Figs. 1, 2, 3, and 4).

3. *The Leaves.*—Grass leaves are always arranged in two opposite rows on the stem. Thus if one leaf is on the north side of the stem, the next one above will be on the south side, the next again on the north, and so on, as in Figs. A and B, p. 169. Now let it be remembered that in sedges (which resemble grasses very closely) the leaves are in *three rows* instead of two.

Every grass leaf consists of two parts, the lower which surrounds the stem like a sheath (and so called the "sheath"), and the upper which grows away from the stem, and called the "blade." On close examination the sheath is seen to be split down from the point opposite to the blade to the joint of the stem. (See plate, Figs. 1, 2, 3, and 5).

The "blade" is more or less flat, and pointed. In many cases the upper surface is "channeled," *i. e.* trough shaped. The ribs, which run from end to end, usually show very plainly, especially the middle one, called the "mid-rib." The tip or end of the blade may come to a plain point, or it may be shaped like the bow of a boat when it is said to be "keeled." We also say of the whole blade that it is keeled when the mid-rib projects as a sharp ridge from the under surface.

At the point where blade and sheath unite there is usually a projecting tongue called the "ligule." It must be closely looked at, and its structure clearly made out, as in some cases it is of much importance in distinguishing kinds from one another. (See plate, Fig. 2.)

4. *The Flower Head.*—It is always important to notice the general shape of the flower head. The two principal forms are the "spike," as in timothy, wheat, barley, etc., and the "panicle," as in oats, Kentucky Blue grass, the tassel of corn, the head of sugar cane, Johnson grass, etc. (Figs. A and B). In the "spike" the

flowers are clustered into a more or less close cylinder, while in the "panicle" they are scattered irregularly upon spreading branches.

5. *The Flowers.*—A grass flower is a small thing and often one has to use a microscope to make out all its parts. Instead of having pretty colored leaves, as in garden flowers, the flowers of grasses have chaff only; but if we look carefully at the chaff we will find that there are many interesting differences. Thus in some the chaff may be blunt, in others pointed, and in others again prolonged into a beard of greater or less length. Moreover, in the same grass there are differences in the chaff which may be made out.

The grain or seed is enclosed in the chaff more or less loosely. In wheat the grain easily separates from all the chaff, as it does also in rye and corn. In most cases some of the chaff adheres to the grain, as in oats, barley, Kentucky Blue grass, Orchard grass, Red Top, etc. In examining the grain it is necessary to note carefully the shape and the surface characters. Some grains are smooth, while others are rough, or in some cases hairy.

As many of the foregoing points as possible should be noted in the examination of any unknown grass, whose name and qualities are desired.

In sending a specimen of a grass for examination it is always well to get a complete plant, which will include the underground part, the stem, the leaves, and the flower head with seed.

For the beginning of the examination of grasses get the most excellent pamphlet called "The Agricultural Grasses and Forage Plants of the United States," by Dr. George Vasey, and published by the Department of Agriculture, Washington, D. C. It can be had free on application to the department.

Then get "The Best Forage Plants," by Dr. F. G. Stebler and Dr. C. Schroeter. It may be bought of any good bookseller for about $2.50 to $3.00. Both these works are fully illustrated, and the second is especially valuable in practical suggestions.

For other books I will refer the reader to my list published in last year's report, pp. 139 and 140.

Let it be remembered that we are growing and experimenting with a good many wild grasses, in addition to the "tame" species, upon the Agricultural Experiment Station, and that information regarding many of these may be obtained upon request. I will be glad to examine any specimens sent, and give such information as to probable value, habits, etc., as is possible. In sending please observe the following directions:

1. Collect good specimens, including roots, stems, leaves, and flowering or fruiting heads.
2. In case you send more than one kind, attach a tag to each sample.
3. Number your samples from one (1) upwards, and put your name also on the tag.
4. Wrap the samples, one by one, in a newspaper, and send to me by mail.
5. On packages so prepared, and containing no other writing, the postage is ONE CENT FOR EACH OUNCE.
6. Send a postal card with your package to let me know to whom to make reply, and giving any items which may be of value.

If you retain *duplicate samples*, similarly numbered, I can reply by referring to the numbers alone.

## EXPLANATION OF THE PLATE.

Structure of leaf and stem of Big Blue Stem (*Andropogon provincialis*):

Fig. 1. Portion of a stem and leaf. At *a* is a joint or "node"; from *a* to *b* is the sheath of the leaf; above *b* the base only of the leaf is shown.

Fig. 2. Part of the stem and leaf split open; the half stem lies in the leaf sheath *d*; at *c* is shown the little tongue, or "ligule," at the point where sheath and blade unite.

Fig. 3. Part of stem and joint split open; at *f* is the joint and at *e* the sheath.

Fig. 4. An end view of a stem cut squarely across, showing it to be solid; that is, not hollow. The little dots are the woody strings which run lengthwise through the stem.

Fig. 5. An end view of the sheath cut squarely across, showing how its edges lap over one another.

Fig. 6. An end view of a leaf cut squarely across, showing the channel or furrow running through the middle.

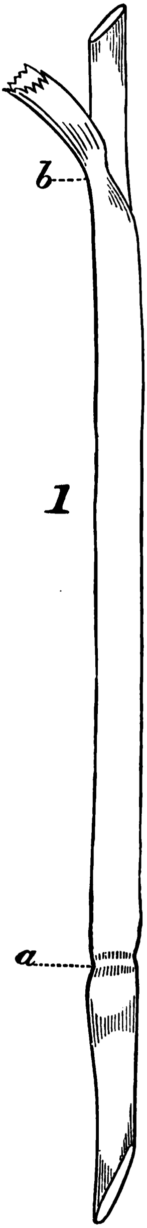
Fig. 7. An enlarged view of Fig. 6, showing the positions of the veins, which appear like small round figures in the drawing, (enlarged six times).

Fig. 8. The center of Fig. 7, enlarged to thirty-six times the natural size, showing at *g*, *g* the cut ends of the veins. Smaller veins lie between these, as shown in the figure. At *h* is shown a layer of tough fibres, and at *i* the soft tissue in the center of the leaf.

Fig. 9. An end view of leaf vein (*g*, at left hand of Fig. 8) enlarged 200 times the natural size. At *j* is the mass of tough fibres of the upper surface of the leaf, and at *k* that of the lower surface. The vein is largely composed of these tough fibres, which are drawn with circular outlines with a dot in the center.

Fig. 10. A small piece of the skin (epidermis) of the lower surface of the leaf showing the oblong cells with wavy walls, and at *l* two rows of breathing pores (stomata). This figure is magnified 250 times the natural size.

Fig. 11. End views of two dry leaves, cut squarely across, showing how they roll backwards, so that the under surface is protected. Slightly enlarged.



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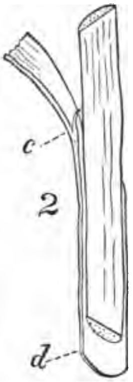

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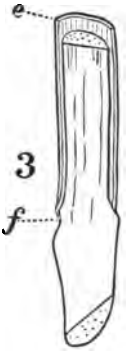

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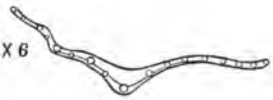

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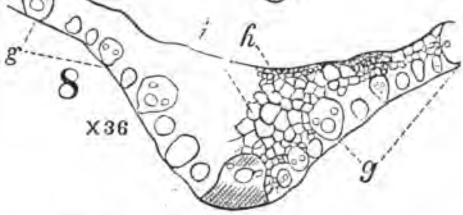

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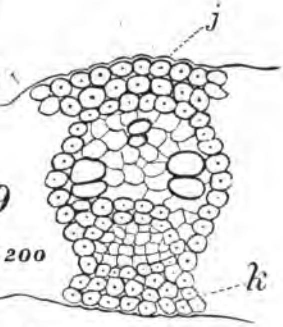

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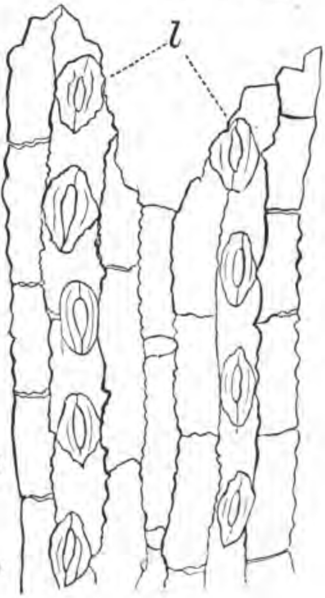

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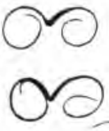

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## XVI.—THE NEBRASKA FLORA.

In the Botanical Department of the University we have been at work for many years endeavoring to make a complete list of the plants of the state. Year by year the materials at command have increased and it is now possible to publish a reasonably complete catalogue. I take pleasure in transmitting the "Catalogue of the Flora of Nebraska," prepared by Mr. Herbert J. Webber, my assistant in botany, and recommend that you print it as an appendix to this report. It is a most valuable work, both for the facts it contains as to the distribution of the grasses, forage plants, trees, shrubs and other higher forms, but also for the fungi and other lower plants, many of which are of direct economic interest to mankind.

# CATALOGUE OF THE FLORA OF NEBRASKA.

## PROTOPHYTA—ANTHOPHYTA.

By HERBERT J. WEBBER, M. A.

# A CATALOGUE OF THE FLORA OF NEBRASKA.

## INTRODUCTION.

For some time Nebraska botanists have felt the need of a catalogue of the flora of the state, so far as known. It is to supply this want, and to render possible the publication, at some future time, of an approximately complete list, that this catalogue is prepared.

Nebraska, in position, is especially interesting, being about the geographical center of the United States. One crossing the plains a few years ago would not have predicted the present luxuriance and present possibilities. With the advent of civilized man, climatic conditions are changing. Moister air brings more luxuriant and varied vegetation. Since the checking of prairie fires, natural groves are springing up along the streams, followed by the appearance of many forest plants. Especially is this noticeable along the eastern borders. The eastern and valley flora, so long separated from the western by the Missouri river and "Great Desert," is rapidly spreading over. So rapid is this change that one can almost see an advance from year to year.

From east to west the elevation gradually increases until in the extreme western part of the state it reaches an altitude of from 4,000 to 5,000 feet, and in one place — "Scott's Bluff," Cheyenne county — is said to reach the height of fully 6,000 feet. In all this high western portion, including about two rows of counties, running north and south, we find the characteristic mountain flora. The southeastern portion of the state — Richardson county — has an elevation of only about 800 feet.

Between the two advancing floras a portion of the native flora of the "Great Desert" remains, and before cultivation has advanced to such an extent as to overcome this, it is desirable that it be thoroughly studied and recorded.

Many things, once common, are gradually disappearing. The Buffalo grass (*Buchloe dactyloides*) once the prevailing plant, is, in eastern Nebraska, found only in small patches, and is fast becoming rare. The wild pumpkin (*Cucurbita fœtidissima* H. B. K.) said, formerly, to have occurred in the eastern part of the state — Brownville (?) — is now limited to the west and is there rare.

The now prairie state was, perhaps, at one time wholly wooded, or much more so than at present, and the forest extension downward from the Rocky mountains may possibly have connected with the eastern forest region. This supposition is based chiefly on the distribution of the yellow pine (*Pinus ponderosa* Dougl. var *scopulorum* Eng.) in Nebraska, and is, possibly, somewhat premature. The facts, however, surely lead one to suspect this.*

The yellow pine of the western forests extends in a narrow strip on what is called "Pine ridge" (which enters the state from Wyoming in extreme northwestern

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* Prof. Aughey, in his Physical Geography of Nebraska, has made the same deductions from a geological standpoint.

Nebraska, in Sioux county), eastward, following the trend of the Niobrara river, to Keya Paha and Rock counties, a distance of 250 miles. It is found, also, in widely-separated localities in the central part of the state.

In Custer county it occurs in but a single deep canon ("Pine canon," crossing the 100th meridian), so far as known, but in such quantity that a saw mill was set up in the canon. Pine trees occur also in a few canons on the Loup river, in northern Valley county, and are reported as occurring in isolated canons in Greeley county. The three latter localities are separated from each other by nearly forty miles, and are nearly a hundred miles south of the Pine ridge region. Decaying pine stumps and scattered trunks are said to occur in various places on the central and western plains.

These isolated groups and straggling remains seem to indicate that all of treeless, barren, central and western Nebraska was once one forest, stretching over the sand hill region from Custer county northward to Long Pine, and thence westward to the Rocky mountains.

Many theories have been advanced to explain the treeless prairie region of the central United States. The one, perhaps, most commonly accepted is the scantiness of the rainfall. Professor Whitney thinks "that the extreme fineness and depth of the usual prairie soil will account for the absence of trees." Dr. Asa Gray concludes that the *eastern* portion of this now woodless plain may not always have been woodless, but says nothing as to the possible connection of the eastern with the western forests, and leaves the reader with the impression that he looks upon them as never having been connected, although believing that they do not occupy at present the position that they originally did. Speaking especially of the border between the central prairie and eastern forest regions Dr. Gray says:

"I am disposed, on general considerations, to think that the line of demarkation between our woods and our plains is not where it was drawn by nature. Here, when no physical barrier is interposed between the ground that receives rain enough for forests, and that which receives too little, there must be a debatable border, where comparatively slight causes will turn the scale either way. Differences in soil and difference in exposure will here tell decisively. And along this border, annual burnings — for the purpose of increasing and improving buffalo feed — practiced for hundreds of years by our nomad predecessors, may have had a very marked effect. I suspect that the irregular border line may have in this way been rendered more irregular, and have been carried further eastward wherever nature of soil or circumstances of exposure predisposed to it." (Forest Geography and Archæology, by Asa Gray, Am. Jour. Sc. and Arts, vol. XVI, 1878.)

Prof. Sargent, although affirming that it is merely a surmise, without, at present, circumstantial evidence, strongly asserts his belief that the eastern border of this treeless region at one time extended much further westward. He gives the possible limit as about the 95th meridian, in western Iowa, but does not seem to consider it possible that it may have extended into, and possibly through, Nebraska to the Rocky mountains.

We now know from actual tests, many times repeated in all portions of Nebraska, that trees will grow and grow well. Eastward as far as the 100th meridian, in the very heart of the plain region, we now have circumstantial evidence convincing in character that trees have at some time covered an extended area.

As to the possible destruction of this supposed forest, if it ever existed, we can only very unsatisfactorily surmise. The annual burning by Indians, suggested by Dr. Gray as possibly having influenced the present eastern line between forest and prairie, may possibly be considered as having also materially influenced our western separating line. Several observations seem to give this theory considerable prominence.

Until very recently (twenty years ago perhaps) the annual burnings, extending as far eastward as the Missouri river, destroyed whatever trees or shrubs took root in exposed positions, thus hindering the growth of forests and introduction of forest plants as above referred to. Since the checking of these prairie fires, forests are springing up as if by magic, and every stream is fast becoming lined. Not satisfied with this, the bur oak and green ash, "pushing in their desires," are spreading out and in places taking possession of untilled upland. It seems that at no distant day, were this spreading not limited by cultivation, Nebraska would again be, as we surmise it has once been, a *forest.* Professor Sargent's distribution maps already need correction.

In some cases, as in the Pine canon of Custer county, so prominently mentioned above, Cedar canon of the same county, and other isolated canons of the state where large trees occur, it devolves upon us to explain their escape from these annual fires. In all cases that have come under my observation this, I think, may be very plausibly done. Places will undoubtedly be found that cannot be so explained, but these instances illustrate a significant tendency.

Cedar canon, near New Helena, Custer county, Nebraska, contains large trees of red cedar, hackberry, box-elder, ash, elm, cherry, and plum. Ash and box-elder trees reach to nearly one and one-half feet in diameter. The red cedars grow chiefly on the sides of the bluffs and frequently reach quite a large size. A section of a trunk in the University cabinet from this canon measures about two feet in diameter and is something over 150 years old. The canon is about one and a half miles or more long, extending in a northwesterly direction. The sides are precipitous and from 100 to 200 feet high. Scrubby bushes of the hardy shrub, *Shepherdia argentea,* line the edges of the bluffs. Occasionally red cedars occur just over the edge above, in which case they are usually charred and dead, probably killed by the effects of the fires. The canon, where it ends, does not run out gradually, but drops down abruptly. This fact, connected with the direction of the canon northwest to southeast, the very steep sides (in almost all places), and the appearance of the outer trees, leads me to conclude that this and perhaps the other few isolated wooded canons are among the fortunate ones which, by their physical formation, are protected from the ravages of the fires which rage without. It will be remembered that these prairie fires most frequently run in a southeasterly direction.

By very careful inquiry I learn that Pine canon, with its interesting contents possesses relatively the same characteristics.

Similar instances of the probable disappearance of forests occur elsewhere. Professor Rothrock describes one in South Park, Colorado: "From some facts observed I am led to think that at no distant past the growth of *Coniferæ* extended much lower in the park than it now does. I have seen the decaying remains almost down to the Platte. * * An occasional isolated clump of these trees still survives, far removed from their associates on the mountain side; and at times one may observe that the prolongations of pine woods, which extend out into the park, become less and less dense, until finally only a single tree remains at intervals, these disappearing, and then only the half decayed remains reach further out toward the valley. In one place it was observed that the tops of these dead trees all pointed to the east. This suggested the idea that the destruction may have been due to one of the fierce west winds which, during the fall months, are so prevalent in South Park. Once destroyed, other vegetation might readily crowd the young trees out. A notable example of this was seen in one portion of the foothills, where a whole forest of *Pinus edulis* lay prostrate, with not a single young tree coming on." Winds may have aided the recession of the pine forests in Nebraska, but could not be considered, I think, as of much consequence here.

Other similar changes might be mentioned, but suffice it to say, that at the present time, with the peculiar intermingling of eastern, western and central floras, Nebraska is, to the botanist, an interesting place.

Among the particular points of interest may be mentioned the "Salt basin" at Lincoln, and the large surrounding saline region, bringing within our scope many forms almost exclusively marine. Especially is this true of the algal flora (as, *Biddulphia lævis* Ehr, *Amphiprora pulchra* Bail., *Conferva inæqualis* Rabenh., *Enteromorpha compressa* (L.) Grev.).

Dr. Bessey, in his report on grasses, as botanist of the State Agricultural Society, divided the state into six botanical regions, the divisions being based on physical characteristics, chiefly that of elevation. Whether characteristic differences in their flora may be recognized remains to be seen. It is certain, however, that a natural division into eastern or Missouri river valley region, central or sand hill region, and western or mountain region above indicated may be made. In the distribution of her flora, Nebraska is *continental*. The eastern region has a flora noticeably eastern in character. The central or sand hill region still preserves the characteristic representatives of the "Great Plains." This region might properly be divided into a northern and a southern region by the Platte river. The portion south of the Platte can hardly be classed as sand hills. The western region has the characteristic usually low, wooly, scapose plants of the mountain flora.

In regard to nomenclature I may claim nothing original, except perhaps in a few particular species. I have endeavored in all cases to accept the latest and best authenticated names. The general system is, with a few exceptions, that adopted by Dr. C. E. Bessey in his Botany. In internal arrangement of families and genera various authors are followed. In the *Anthophyta* I have followed the system of Dr. Chr. Luerssen, of the University of Leipzig (Handbuch der Systematischen Botanik, II. Band) in the arrangement of families, believing it to be the most natural of any yet proposed, and wishing to bring it before our students more prominently for consideration. The synonymy here is based chiefly on "Coulter's Manual" and the "Catalogue of Anthophyta and Pteridophyta reported as growing spontaneously within a hundred miles of New York City." As to the other branches, I follow, in general,— in the *Musci*, Lesquereux and James; in *Hepaticæ*, Underwood's "North American Hepaticæ;" in *Fungi*, Saccardo's "Sylloge Fungorum;" in *Algæ*, Wolle's "Fresh Water Algæ of the United States," and De Toni's "Sylloge Algarum."

Among the parasitic fungi, new hosts are in many cases added to our already large list. Three specimens of rusts, from their difference from known related species, are considered as new varieties; several changes are made here also as to the identity of species and connection of stages, justified, I think, by the facts discovered.

In the preparation of this list many friends have aided me. I cannot too heartily and sincerely express my thanks to Dr. C. E. Bessey, my instructor, for aid in numerous ways, and for the use of his collections and the herbarium of the University of Nebraska. The valuable addition of Long Pine and Fort Robinson specimens are chiefly of his collecting. To Messrs. T. A. Williams, of Weeping Water, Roscoe Pound and J. G. Smith, of Lincoln, I am indebted for much aid and many additions to my herbarium. Mr. Williams furnished the greater part of the information in regard to Weeping Water plants. The list of lichens is entirely his work. Mr. Pound aided greatly in the fungi, principally the imperfect forms, furnishing many new things. The list of yeast plants and Mucoraceæ are entirely his work. I also received much aid from him in the Anthophytes.

Mr. Smith gave the use of his herbarium and furnished information in regard to various plants.

For my list of Antelope county specimens I am indebted to Miss E. R. McGee, of Farley, Iowa, who has kindly furnished me specimens.

From the herbarium of the State Normal School at Peru, through the kindness of Mr. Taylor, I obtained localities for 250 flowering plants, and fifty additions to my herbarium.

For aid in the identification of species, thanks are due to Drs. N. L. Britton, J. M. Coulter, L. M. Underwood, George Vasey, Charles R. Barnes, and George Rex; Professor L. H. Bailey, Mr. J. B. Ellis, Mr. Charles H. Peck, Rev. Francis Wolle, and Mr. A. P. Morgan.

To the many others who have aided me in this work thanks are cordially tendered.

The only similar publication preceding this is "The Catalogue of the Flora of Nebraska," by Professor Samuel Aughey, issued in 1875, including Anthophyta, Pteridophyta, Bryophyta, and a few other algæ and lichens. The length of time intervening justifies a second catalogue, even if we overlook the fact that the first was based, or appears to have been based, chiefly on range and distribution as given by authors, instead of specimens actually collected within the limits of the state and preserved for reference.

The present catalogue is based on specimens in actual existence and subject to correction if necessary. I have under almost every species referred to the herbarium where a specimen, may be found, the reference being by letter as follows:

B.—In herb. C. E. Bessey. P.—In herb. Roscoe Ponnd. W.—In herb. T. A. Williams. S.—In herb. J. G. Smith. U.—In herb. University of Nebraska.

Specimens that are not followed by one of the above letters are to be considered as preserved in my own herbarium.

A few specimens, chiefly among the algæ, where found in very small quantities, have not been preserved.

"Coulter's Manual" and the new edition of "Gray's Manual" definitely mention a few plants as occurring in Nebraska that I have not found. These I insert, in every case stating under the particular species on what authority it is admitted. I very much doubt the occurrence of a few species thus entered and indicate this doubt by ?, following the specific name.

In every case a locality is cited and in many cases several. Those cited from

Lincoln, Hastings, Wymore, Brownville, Tecumseh, Nebraska City, Milford, Broken Bow, Anselmo, Alliance, Belmont, Crawford, Harrison, Hat Creek basin, Sioux county; Dismal river, Thomas county; and Thedford are chiefly of my own collecting, as are also many from Weeping Water and Peru. The other localities are from collectors as indicated above, or in the catalogue.

Introduced and escaped species, when known to be such, are printed in SMALL CAPITALS.

This catalogue contains 1,882 species and varieties; of which 39 are Protophyta, 95 Zygophyta, 20 Oophyta, 691 Carpophyta, 47 Bryophyta, 17 Pteridophyta, and 973 Anthophyta.

It is hoped that the publication of this catalogue may lead to further additions to the knowledge of our flora, and to the awakening of a more general interest in the subject.

It is intended to publish supplements to this list from year to year, including additions and corrections. It is earnestly requested that botanists and others interested send notes and specimens of plants not named in the catalogue, or from new localities, in order that they may be studied and systematically recorded. All such communications should be addressed to the Botanical Department of the State University of Nebraska, Lincoln, Nebraska.

BOTANICAL LABORATORY, UNIVERSITY OF NEBRASKA, June 1, 1890.

# PROTOPHYTA.

## CLASS I.—MYXOMYCETES.* THE SLIME MOULDS.

### 1. PLASMODIOPHOREÆ.

1. PHYTOMYXA Schroet.

   1. *Phytomyxa leguminosarum* (Frank.) Schroet. (*Schinzia leguminosarum* Frank.) Clover tubercle. On white clover (*Trifolium repens*). Lincoln. Very common; forming small clavate tubercles on the roots. Apparently not injurious.

### 2. TRICHIACEÆ.

2. HEMIARCYRIA Rost.

   2. *Hemiarcyria clavata* (Pers.) Rost. On old wood. Lincoln; Peru.

   3. *Hemiarcyria rubiformis* (Pers.) Rost. On decaying logs. Lincoln.

### 3. ARCYRIACEÆ.

3. LYCOGALA Mich.

   4. *Lycogala epidendrum* Buxb. On old logs. Lincoln; Crete.

   5. *Lycogala flavo-fuscum* (Ehrenb.) Rost. On decaying stumps. Lincoln.

4. ARCYRIA Hall.

   6. *Arcyria cinerea* (Bull.) Shum. On old wood. Lincoln.

   7. *Arcyria pomiformis* (Roth.) Rost. On decaying wood. Lincoln.

### 4. CRIBRARIACEÆ.

5. DICTYDIUM Schrad.

   8. *Dictydium cernuum* (Pers.) Nees. On old logs. Lincoln. U.

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*Late authorities place the *Myxomycetes*, or *Mycetozoa* as now called, in closer relation to the animal than the vegetable kingdom. I admit them to this list, because they are so generally studied by botanists.

### 5. LICEACEÆ.

6. **Lindbladia** Fries.

   9. *Lindbladia effusa* (Ehr.) Rost. On old stumps. Lincoln.

### 6. STEMONITACEÆ.

7. **Stemonitis** Gled.

   10. *Stemonitis dictyospora* Rost. On stumps, etc. Lincoln. Dr. Rex believes this to be as common as *S. fusca*, although, so far as known, it has not been before recorded from this country.

   11. *Stemonitis morgani* Pk. On decaying logs. Lincoln.

### 7. SPUMARIACEÆ.

8. **Spumaria** Pers.

   12. *Spumaria alba* (Bull.) DC. On stems of weeds, very common. Lincoln; York.

9. **Diachæa** Fries.

   13. *Diachæa leucopoda* (Bull.) Rost. On leaves, common. Lincoln.

### 8. DIDYMIACEÆ.

10. **Didymium** Schrad.

   14. *Didymeum farinaceum* Schrad. On old wood. Lincoln.

   15. *Didymium microcarpum* (Fr.) Rost. (*D. xanthopus* Ditm.) On ground and old decaying stems. Lincoln.

11. **Chondrioderma** Rost.

   16. *Chondrioderma floriforme* (Bull.) Rost. On old stems. Lincoln; Peru.

   17. *Chondrioderma globosum* (Pers.) Rost. On decaying leaves. Lincoln.

### 9. PHYSARACEÆ.

12. **Tilmadoche** Fr.

   18. *Tilmadoche nutans* (Pers.) Rost. On decaying logs. Lincoln.

13. **Fuligo** Hall.

   19. *Fuligo septica* (Link.) Gmel. On decaying logs. Crete.

14. **Physarum** Pers.

   20. *Physarum cinereum* (Batsch.) Pers. On stems and leaves (living or dead), common. Lincoln.

   21. *Physarum contextum* Pers. On old wood. Lincoln.

   22. *Physarum polymorphum* (Mont.) Rost. On decaying wood. Lincoln.

## CLASS II.—SCHIZOMYCETES.

### 10. BACTERIACEÆ.

15. **Micrococcus** Cohn.

   23. *Micrococcus amylovorus* Burrill. Apple and pear blight. In twigs and leaves, common. Causing the leaves to early turn brown and fall. Lincoln.

   24. *Micrococcus ureæ* Cohn. In stale urine.

16. **Bacterium** Cohn.

   25. *Bacterium termo* Dujardin. In putrid water, common. Lincoln.

17. **Leptothrix** Kutzing.

   26. *Leptothrix buccalis* Robin. In decaying teeth, common.

18. **Spirillum** Ehrenberg.

   27. *Spirillum rugula* Winter. In stagnant and putrid water. Lincoln. (Bessey.)

28. *Spirillum undula* (Muller) Ehrb. In putrid water, common. Lincoln.

19. BEGGIATOA Trevisan.

29. *Beggiatoa alba* (Vaucher) Trevisan. var. *marina* Cohn. With threads of algæ in brackish water, common. Lincoln.

NOTE.—Besides the above species, certain pathogenous forms are known to occur, as those accompanying and likely producing the diseases known as diphtheria, consumption, small-pox, hog-cholera, Texas fever, the corn germ of Dr. Billings, etc.

## CLASS III.—CYANOPHYCEÆ. THE GREEN SLIMES.

### 11. CHROOCOCCACEÆ.

20. MERISMOPEDIA Meyen.

30. *Merismopedia glauca* Næg. Common. Lincoln; Thedford. August.

31. *Merismopedia violacea* (Breb.) Ktz. Thedford, August 7, 1889. Quite common in stagnant ponds, forming violet or purplish slimy masses that sometimes reach the size of a man's hand. In appearance it much resembles floating particles of decaying flesh, in this respect being similar to *Chlamydococcus pluvialis* A. Br., from which it is with difficulty distinguished without the aid of a microscope. (The latter I collected in quantity in a pond in Wessington Hills, Dakota, last April. The color is a somewhat deeper violet purple.) This interesting little plant has not been found before in America, so far as known. It is distinguished from known American species by its smaller size and violet color.

21. CHROOCOCCUS Næg.

32. *Chroococcus cohærens* Næg. Common in stagnant ponds. Thedford, August 7, 1889.

### 12. NOSTOCACEÆ.

22. SPIRULINA Link.

33. *Spirulina tenuissima* Kg. Stagnant water. August. Lincoln.

23. OSCILLARIA Bosc.

34. *Oscillaria froelichii* Kg. Ponds and creeks. Lincoln.

35. *Oscillaria tenuis* Ag. Ponds, etc., common, Lincoln.

24. CYLINDROSPERMUM Kg.

36. *Cylindrospermum flexuosum* Rab. Streams, etc. November. Lincoln.

25. ANABÆNA Bory.

37. *Anabæna flos-aquæ* Kg. var. *circinalis* (Rab.) Kirch. In ponds, common. Lincoln.

26. NOSTOC Vauch.

38. *Nostoc commune* Vauch. On wet ground and wood, common. Lincoln; Culbertson.

39. *Nostoc pruniforme* Ag. Very common, in stagnant ponds. Thedford, August 7. Forming olive or dark brown, nearly regular balls, from $1^{mm}$ in diameter to the size of a plum.

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## ZYGOPHYTA.

## CLASS I.—ZOOSPOREÆ.

### 13. PALMELLACEÆ.

27. SCENEDESMUS Meyen.

40. *Scenedesmus acutus* Meyen. In aquarium. Lincoln.

41. *Scenedesmus caudatus* Corda. var. *typicus* Kirch. Very common in ponds, aquaria, etc. Lincoln; Thedford, August 7.

42. *Scenedesmus dimorphus* Kg. In stagnant ponds, etc. Thedford, August 7, Lincoln.

43. *Scenedesmus obtusus* Meyen. Very common in ponds, presenting a number of forms. Thedford, August 7; Lincoln.

28. Pediastrum Meyen.

44. *Pediastrum angulosum* (Ehrb.) Menegh. In ponds, not uncommon. Thedford, August 7.

45. *Pediastrum boryanum* (Turp.) Menegh. Common in ponds. Thedford, August 7.

29. Raphidium Kg.

46. *Raphidium convolutum* (Corda.) Rab. In stagnant water, not common. Lincoln, October 11.

47. *Raphidium polymorphum* Fres. var. *aviculare* A. Br. In aquarium. Lincoln.

48. *Raphidium polymorphum* Fres. var. *sigmoideum* Rab. In stagnant pools and aquaria. Thedford, August 7. Lincoln.

30. Polyedrium Næg.

49. *Polyedrium trigonum* Næg. var. *punctatum* Kirch. Rare. A plant found at Thedford, August 7, I take to be this variety.

50. *Polyedrium longispinum* (Pertz.) Rab. In aquarium. Lincoln.

51. *Polyedrium reinschii* Rab. With eight spines, obtuse. In stagnant water. Lincoln.

31. Characium A. Br.

52. *Characium nægelii* A. Br. On filaments of *Mesocarpus*. Lincoln.

32. Pleurococcus Menegh.

53. *Pleurococcus dissectus* (Kg.) Næg. (*Protococcus viridis* Ag. var. *dissectus* Næg.) On moist decaying wood. Saltillo. P.

54. *Pleurococcus miniatus* (Kg.) Næg. On damp earth in greenhouse. Lincoln.

33. Protococcus Ag.

55. *Protococcus viridis* Ag. On bark of trees, etc., common. Lincoln. A deep green aquatic variety is quite common in ponds at Thedford.

34. Euglena Ehrb.

56. *Euglena viridis* (Schrank.) Ehrb. In stagnant water, very common. Lincoln; Thedford.

## 14. PITHOPHORACEÆ.

35. Pithophora Wittr.

57. *Pithophora œdogonia* (Mont.) Wittr. var. *vaucherioides* (Wolle.) Wittr. In stagnant pools. Lincoln.

## 15. CLADOPHORACEÆ.

36. Cladophora Kg.

58. *Cladophora canalicularis* Kg. In creeks, etc., common. Lincoln.

59. *Cladophora fracta* (Dillw.) Kg. var. *gossypina* (Draparn.) Rab. Stagnant water. Lincoln.

60. *Cladophora glomerata* L. Common in streams. Lincoln.

## 16. ULOTHRICHIACEÆ.

37. Conferva Lk.

61. *Conferva inequalis* Rab. A form found in the artesian well basin (salt), of

Lincoln, I take to be this species, although it is not given by Wolle in his "Fresh Water Algæ."

62. *Conferva vulgaris* Rab. var. *farlowii* Wolle. Very rank in aquarium. Water from Salt creek near Lincoln.

38. STIGEOCLONIUM Kg.

63. *Stigeoclonium nanum* (Dillw.) Kg. On stones and stems in thermal water from engine. Lincoln.

39. HORMISCIA Fries.

64. *Hormiscia zonata* (Web. & Mohr.) Aresch. (*Ulothrix zonata.*) Lincoln.

### 17. ULVACEÆ.

40. ENTEROMORPHA Lk.

65. *Enteromorpha compressa* (L.) Grev. Salt basin, common. Lincoln.

66. *Enteromorpha intestinalis* (L.) Lk. Salt basin, common. Lincoln.

## CLASS II.—CONJUGATÆ.

### 18. DESMIDIACEÆ. THE DESMIDS.

41. PENIUM Bréb.

67. *Penium closterioides* Ralfs. Ponds, etc. Lincoln. (Bessey.)

42. CLOSTERIUM Nitsch.

68. *Closterium moniliferum* Ehrb. In pools. Lincoln.

69. *Closterium parvulum* Næg. In creek. Lincoln.

70. *Closterium striolatum* Ehrb. In creeks, etc. Lincoln.

43. DOCIDIUM Breb.

71. *Docidium baculum* (Breb.) D. By. Rare. Thedford, August 7.

44. COSMARIUM Corda.

72. *Cosmarium bioculatum* Breb. Not uncommon. Thedford, August 7.

73. *Cosmarium conspersum* Ralfs. Rare. Thedford, August 7.

74. *Cosmarium meneghinii* Breb. Rare. Thedford, August 7.

75. *Cosmarium nitidum* De Not. Rare. Thedford, August 7.

76. *Cosmarium pulcherrimum* Nord. Rare. Thedford, August 7.

77. *Cosmarium undulatum* Corda. Rare. Thedford, August 7.

45. EUASTRUM Ehrb.

78. *Euastrum verrucosum* Ehrb. Apparently common. Thedford, August 7.

46. STAURASTRUM Meyen.

79. *Staurastrum gracile* Ralfs. Common. Thedford, August 7.

80. *Staurastrum polymorphum* Breb. Not uncommon. Thedford, August 7.

### 19. DIATOMACEÆ. THE DIATOMS.

(Species identified by Wolle.)

47. AMPHORA Ehrb.

81. *Amphora salina* W. Sm. In brackish ponds. Lincoln.

48. CYMBELLA Ag.

82. *Cymbella cymbriformis* Ehrb. var. *parva* (*Cocconema parvum* W. Sm.). Ponds, etc., artesian well.

83. *Cymbella gastroides* Kg. A large form, usually about 130 micromillimetres long. Ponds. Thedford, August 7.

49. STAURONEIS Ehrb.

84. *Stauroneis anceps* Ehrb. Artesian well (salt water). Lincoln.

50. Navicula Bory.
    85. *Navicula brebissonii* Kg. Ponds. Lincoln.
    86. *Navicula cryptocephala* Kg. Streams and ponds. Lincoln.
    87. *Navicula iridis* Ehrb. var. *amphigomphus* Ehrb. Stagnant ponds. Thedford, August 7.
    88. *Navicula lanceolata* Kg. In ponds. Lincoln.
    89. *Navicula major* Kg. Stagnant ponds, common. Thedford, August 7.
    90. *Navicula serians* Breb. Ponds. Lincoln.
    91. *Navicula sphærophora* Kg. Running streams and ponds. Lincoln.
    92. *Navicula viridis* Kg. Ponds. Lincoln.
51. Pleurosigma W. Sm.
    93. *Pleurosigma intermedium* W. Sm. Rare. Thedford August, 7.
52. Amphiprora Ehrb.
    94. *Amphiprora pulchra* Bail. In brackish ponds. Lincoln.
53. Gomphonema Ag.
    95. *Gomphonema clavatum* Ehrb. Rare. Thedford, August 7. Length about thirty-two micromillimetres.
    96. *Gomphonema constrictum* Ehrb. Common in stagnant ponds. Thedford, August 7. (Length 32-64 micromillimetres.)
    97. *Gomphonema constrictum* Ehrb. var. *capitatum*. (*G. capitatum* Ehrb.) In ponds and streams. Lincoln.
    98. *Gomphonema gracile?* Ehrb. var. *dichotomum* (*G. dichotomum* W. Sm.). Ponds, etc., Lincoln.
54. Cocconeis Grun.
    99. *Cocconeis pediculus* Ehrb. Common. Thedford, August 7. Frustule elliptical, 13-19 by 18-22 micromillimetres.
55. Epithemia Breb.
    100. *Epithemia argus?* Kg. In ponds. Lincoln.
    101. *Epithemia gibba* Kg. Not uncommon in stagnant ponds. Thedford, August 7. Lincoln.
    102. *Epithemia turgida* (Ehrb.) Kg. Very common. Thedford, August 7. A beautiful form, from 46-91 micromillimetres long and usually about sixteen wide.
56. Synedra Ehrb.
    103. *Synedra acus* (Kg.) Grun. In brackish ponds. Lincoln.
    104. *Synedra pulchella* Kg. var. *smithii* Ralfs. (*S. acicularis* W. Sm.) Ponds. Lincoln.
    105. *Synedra ulna* (Nitzsch) Ehrb. Common in streams and ponds. Lincoln. Thedford.
    106. *Synedra ulna* (Nitzsch) Ehrb. var. *splendens*. In streams. Lincoln.
57. Fragilaria Lyngbye.
    107. *Fragilaria harrisonii* (W. Sm.) Grun. In stagnant pond. Thedford. Only one frustule found. Size, 14 by 22 micromillimetres.
58. Meridion Ag.
    108. *Meridion circulare* Ag. Ponds and streams. Lincoln.
59. Hantzschia Grun.
    109. *Hantzschia amphyoxis* (Ehrb.) Grun. var *vivax*. (Hantz.) V. Heu. (*Nitzschia vivax* Hantzsch.) Ponds. Lincoln.
60. Nitzschia Grun.
    110. *Nitzschia sigmoidea* (Ehrb.) W. Sm. In brackish ponds. Lincoln.

61. SURIRELLA Turpin.

111. *Surirella ovalis* Breb. var. *ovata* (Kg.) V. Heu. (*Surirella ovata* Kg.) Ponds and streams, common. Lincoln.

62. MELOSIRA Agardh.

112. *Melosira varians* Ag. In stagnant water. Lincoln; Thedford. Forming filaments from 15–16 micromillimetres wide.

63. BIDDULPHIA Gray.

113. *Biddulphia lævis* Ehrb. In running water and brackish ponds, common. Lincoln.

## 20. ZYGNEMACEÆ. THE POND SCUMS.

64. ZYGNEMA Kg.

114. *Zygnema cruciatum* Ag. In stagnant water. Lincoln; Thedford, August 7.

65. SPIROGYRA Link.

115. *Spirogyra adnata* Kg. Stagnant water. Lincoln.

116. *Spirogyra calospora* Cleve. Streams, etc. Lincoln.

117. *Spirogyra decimina* (Mull.) Kg. Stagnant pools. Lincoln.

118. *Spirogyra fluviatilis* Hilse. Stagnant streams. Lincoln.

118½. *Spirogyra inflata* (Vauch.) Rab. In stagnant ponds. Thedford, Thomas county, August 7, 1889.

119. *Spirogyra insignis* (Hass.) Kg. var. *braunii* Rab. Lincoln.

120. *Spirogyra majuscula* Kg. Common in streams. Lincoln.

121. *Spirogyra maxima* (Hass.) Wittr. Ponds. Lincoln.

122. *Spirogyra mirabile* Hass. Ponds, etc. Lincoln.

123. *Spirogyra quadrata* (Hass.) Petit. Ponds. Lincoln.

124. *Spirogyra quinina* (Ag.) Kg. Stagnant water. Common. Lincoln.

## 21. MUCORACEÆ. THE BLACK MOULDS.

66. CHÆTOCLADIUM Fres.

125. *Chætocladium brefeldii* Van Trieghem and LeMon. On onion (with *Rhizopus nigricans*). Lincoln. U.

67. RHIZOPUS Ehrenberg.

126. *Rhizopus nigricans* Ehrenberg. Common black mould. On decaying substances of all kinds, very common. Lincoln.

68. PHYCOMYCES Kunze.

127. *Phycomyces nitens* (Ag.) Kunze. On greasy rags, on squash, on bottle containing castor oil. Lincoln.

69. MUCOR Micheli.

128. *Mucor mucedo* L. On dead insects in water. Lincoln. P.

129. *Mucor clavatus* Lk. On lemon. Lincoln. P.

130. *Mucor racemosus* Fres. Grew spontaneously on paste, since cultivated. Lincoln. P.

70. PILOBOLUS Tode.

131. *Pilobolus crystallinus* (Wigg.) Tode. On ground in greenhouse, on dung. Very common. Lincoln.

## 22. ENTOMOPHTHORACEÆ. THE INSECT FUNGI.

71. ENTOMOPHTHORA Fresenius.

132. *Entomophthora calopteni* Bessey. Grasshopper fungus. Parasitic upon locusts ("grasshoppers"). Lincoln. Very common. Last fall (1889) was apparently a very destructive time. One might easily have gathered

several hundred dead locusts in an hour on the University campus. The affected ones climb to the tops of weeds, and there among the leaves desperately grasp the stem and finally die. Commonly several will be found on the same weed and frequently two or three together, grasping each other in death's embrace. Frequently a pair will be found in coition, both dead or one dead and the other still living, the fungus gradually extending into and killing the living one.

72. **Empusa** Cohn.

133. *Empusa muscæ* (Fr.) Cohn. Fly fungus. On flies in autumn, very common. Lincoln.

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# OOPHYTA.

## Class I.—Zoosporeæ.

### 22½. VOLVOCACEÆ.

72½. **Volvox** Ehrb.

133½. *Volvox globator* L. In ponds, Lincoln. (Bessey.)

## Class II.—Œdogonieæ.

### 23. ŒDOGONIACEÆ.

73. **Œdogonium** Lk.

134. *Œdogonium polymorphum* Wittr & Lund. On filaments of Vaucheria in in ponds. Lincoln.

73½. **Bulbochæte** Ag.

134½. *Bulbochæte subsimplex* Wittr. In stagnant ponds. Thedford, Thomas county, August 7, 1889.

## Class III.—Cœloblasteæ.

### 24. VAUCHERIACEÆ. THE GREEN FELTS.

74. **Vaucheria** DC.

135. *Vaucheria geminata* (Vauch.) DC. var. *racemosa* Walz. Not uncommon. Lincoln.

136. *Vaucheria sessilis* (Vauch.) DC. Common on wet ground. Lincoln. (Bessey.)

### 25. SAPROLEGNIACEÆ. THE WATER MOULDS.

75. **Saprolegnia** Nees.

137. *Saprolegnia ferax* (Guith.) Nees. On box-elder bugs in aquarium. Lincoln.

### 26. HYDROGASTRACEÆ.

76. **Botrydium** Wallr.

138. *Botrydium granulatum* L. On wet ground, common. Lincoln.

### 27. CHYTRIDIACEÆ.

77. **Synchytrium** DeBary.

139. *Synchytrium decipiens* Farlow. In leaves of *Amphicarpæa monoica*. Lincoln. P.

140. *Synchytrium fulgens* Schroet. On leaves of evening primrose (*Œnothera biennis.*), Lincoln. P.

### 28. PERONOSPORACEÆ.

78. PERONOSPORA Corda.

141. *Peronospora arthuri* Farlow. On leaves and stems of evening primrose (*Œnothera biennis*), Lincoln. (Bessey.)

142. *Peronospora effusa* (Grev.) Rabenh. On goose-foot or pig-weed (*Chenopodium album.*), Lincoln.

143. *Peronospora parasitica* (Pers.) DeBary. On shepherd's purse (*Capsella bursa-pastoris*); pepper grass (*Lepidium intermedium* and *Lepidium virginicum); and tansy mustard (*Sisymbrium canescens*). Lincoln. Common.

144. *Peronospora potentillæ* DeBary. On *Potentilla*. Lincoln. (Bessey.)

79. BREMIA Regel.

145. *Bremia lactucæ* Regel. (*Peronospora gangliformis* DeBary.) On wild lettuce (*Lactuca canadensis*), Lincoln.

80. PLASMOPARA Schroet.

146. *Plasmopara australis* (Speg.) Swingle. (*Peronospora australis* Speg. and *P. sicyicola* Trel.) On wild cucumber (*Echinocystis lobata*). Lincoln.

147. *Plasmopara viticola* (Berk. & Curt.) Berl. & DeToni. (*Peronospora viticola* B. & C.) On grape. Lincoln.

81. CYSTOPUS Lev. White rust.

148. *Cystopus bliti* (Biv.) DeBary. On pig-weed (*Amarantus retroflexus* and *Amarantus blitoides*). Lincoln.

149. *Cystopus candidus* (Pers.) Lev. On horse radish (*Raphanus sativus*), pepper grass (*Lepidium intermedium* and *Lepidium virginicum*), shepherd's purse (*Capsella bursa-pastoris*). Lincoln.

150. *Cystopus portulacæ* (DC.) Lev. On common Purslane (*Portulaca oleracea* L.). Lincoln.

151. *Cystopus tragopogonis* (Pers.) Schroet. (*C. cubicus* DeBary). On everlasting or Indian tobacco (*Antennaria plantaginifolia*). Lincoln.

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## CARPOPHYTA.

### CLASS I.—COLEOCHÆTEÆ.

No representatives of this class have as yet been collected in the state.

### CLASS II.—FLORIDEÆ. THE RED SEAWEEDS.

No representatives of this class have as yet been collected in the state.

### CLASS III.—ASCOMYCETES. THE SAC FUNGI.

### *Order Perisporiaceæ. The Blights.*

### 29. ERYSIPHEÆ.

82. PODOSPHÆRA Kunze.

152. *Podosphæra tridactyla* (Wallr.) DeBary. On common cultivated cherry (*Prunus cerasus*), Lincoln; wild plum (*Prunus americana*), Lincoln.

83. SPHÆROTHECA Lev.

153. *Sphærotheca castagnei* Lev. On leaves of dandelion (*Taraxicum officinale*), Lincoln; bur-marigold (*Bidens cernua*), Roca.

154. *Sphærotheca pannosa* (Wallr.) Lev. On leaves of rose (*Rosa arkansana*), Lincoln. Common.

155. *Sphærotheca mors-uvæ* (Schw.) Berk. & Curt. Gooseberry blight. On gooseberry (*Ribes rotundifolium*); and wild black currant (*Ribes floridanum*), Anselmo, Custer county, July 6. Very injurious, attacking fruits, leaves and stems, sometimes destroying almost every fruit in large patches of the host plant. I have not noticed this on cultivated species in Nebraska.

84. PHYLLACTINIA Lev.

156. *Phyllactinia suffulta* (Reb.) Sacc. (*P. guttata* Lev.) On wax-work or bitter-sweet (*Celastrus scandens*), Lincoln.

85. UNCINULA Lev.

157. *Uncinula ampelopsidis* Peck. On leaves of Virginia creeper (*Parthenocissus quinquefolia*), Lincoln.

158. *Uncinula adunca* (Wallr.) Lev. (*U. salicis* [DC.] Wint.) On leaves of black willow (*Salix nigra*), Lincoln; long-leaved willow (*Salix longifolia*), Lincoln; prairie willow (*Salix humilis*), Richardson county.

159. *Uncinula macrospora* Peck. On leaves of elm (*Ulmus americana*). Lincoln. Quite common.

86. MICROSPHÆRA Lev.

160. *Microsphæra alni* (DC.) Wint. On leaves of lilac (*Syringa vulgaris*), Lincoln; burning bush (*Euonymus atropurpureus*), Lincoln. A common species, especially on the first host.

161. *Microsphæra diffusa* Ck. & Pk. On leaves of tick-trefoil (*Desmodium canescens*), Lincoln. Common.

162. *Microsphæra euphorbiæ* B. & C. On leaves of Snow-on-the-Mountain (*Euphorbia marginata*), Lincoln. Not common.

163. *Microsphæra quercina* (Schw.) Burrill. On leaves of chestnut-oak (*Quercus prinus*), Richardson county, August 25; scarlet-oak (*Quercus coccinea*, Nemaha county, August 27.

164. *Microsphæra symphoricarpi* Howe. On leaves of Indian currant (*Symphoricarpos vulgaris*), Lincoln; wolf-berry (*Symphoricarpos occidentalis*), Lincoln.

87. ERYSIPHE Hedw.

165. *Erysiphe cichoracearum* DC. [Includes the following species recognized by Saccardo in Sylloge Fungorum: *Erysiphe lamprocarpa* (Wallr.) Lev.; *E. horridula* (Wallr.) Lev.; *E. montagnei* Lev.; *E. ambrosiæ* Schw.; *E. verbenæ* Schw.; *E. asterum* Schw.] On leaves of hoary vervain (*Verbena stricta*), Anselmo, July 6, Lincoln; blue vervain (*Verbena hastata*), Lincoln; white vervain (*Verbena urticifolia*), Lincoln; iron-weed (*Vernonia fasciculata*), Lincoln; thistle (*Cnicus altissimus*), Lincoln; cocklebur (*Xanthium canadense*), Lincoln; great ragweed (*Ambrosia trifida*), Lincoln; aster (*Aster ericoides*), Lincoln; sunflower (*Helianthus annuus*), Lincoln; golden-rod (*Solidago canadensis*), Lincoln. Probably our most common mildew. Frequently quite destructive.

166. *Erysiphe communis* (Wallr.) Fr. On leaves of virgin's bower (*Clematis virginiana*), Lincoln; small-flowered crowfoot (*Ranunculus abortivus*), Lincoln; astragalus (*Astragalus canadensis*), Lincoln, Richardson county; astragalus (*Astragalus adsurgens*), Belmont, July 24.

### 30. PERISPORIEÆ.

88. EUROTIUM Link.

167. *Eurotium herbariorum* (Wigg.) Link. (Includes *Aspergillus glaucus* (L.) Link.) Herbarium mould. On various decaying organic substances. Very common. Lincoln.

89. ASPERGILLUS Michel.

168. *Aspergillus candidus* Link. On agarics, decaying wood, mucilage, dead insects, etc. Lincoln.

169. *Aspergillus clavatus* Desm. On meat, Lincoln. P.

170. *Aspergillus flavus* Link. On dead moths and excrement of larvæ in breeding cages. Lincoln. P.

171. *Aspergillus fulginosus* Peck. On bread. Lincoln. P.

172. *Aspergillus griseus* Link. On gelatin. Lincoln. P.

173. *Aspergillus repens* (Corda) Sacc. On *Armillaria mellea*, decaying *Polypori*, etc. Lincoln. P.

174. *Aspergillus virens* Link. On tissues of dog in alcohol. Lincoln. P.

90. STERIGMATOCYSTIS Cramer.

175. *Sterigmatocystis butyracea* Bain. On bread and *Armillaria mellea*. Lincoln. P.

176. *Sterigmatocystis glauca* Bain. On aniline. Lincoln. P.

177. *Sterigmatocystis nigra* V. Tiegh. On bread. Lincoln. P.

91. PENICILLIUM Link.

178. *Penicillium crustaceum* (L.) Fries. (*P. glaucum* Lk.) On ink, carmine stain, apple, etc. Lincoln.

179. *Penicillium crustaceum* (L.) Fries. var. *coremium* Sacc. On paper. Lincoln.

## *Order Pyrenomycetes. The Black Fungi.*

### 31. SPHÆRIACEÆ.

92. VALSA Fr.

180. *Valsa ambiens* (Pers.) Fr. In stems of elder-berry (*Sambucus canadensis*), Lincoln.

181. *Valsa leucostoma* (Pers.) Fr. In bark of plum (*Prunus americana*), Lincoln. Very common.

182. *Valsa nivea* (Hoffm.) Fr. On limbs of black willow (*Salix nigra*), Lincoln.

93. DIATRYPE Fr.

183. *Diatrype albo-pruinosa* (Schw.) Cooke. On limbs of oak (*Quercus*), Peru. (*Sphæria albo-pruinosa* Schw.)

184. *Diatrype webberi* Ell. & Ev. (n. sp. in lit.). In stems of green ash (*Fraxinus viridis*), Lincoln. Common.

94. ROSELLINA De Not.

185. *Rosellina aquila* (Fr.) De Not. On bark of *Robinia*, Milford.

95. XYLARIA Hill.

186. *Xylaria hypoxylon* (L.) Grev. On decaying wood. Common. Lincoln; Plattsmouth.

187. *Xylaria polymorpha* (Pers.) Grev. Common on decaying wood, at base of stumps, etc. Lincoln.

96. USTULINA Tul.

188. *Ustulina vulgaris* Tul. On decaying stumps. Not uncommon. Lincoln.

97. HYPOXYLON Bull.

189. *Hypoxylon annulatum* (Schw.) Mont. On bark of oak (*Quercus*), common. Lincoln.

190. *Hypoxylon fuscum* (Pers.) Fr. On limbs of green ash (*Fraxinus viridis*), Peru.

191. *Hypoxylon rubiginosum* (Pers.) Fr. On decaying wood, common. Lincoln; Milford; Dismal river, Thomas county.

98. DALDINIA Ces. & DeNot.

192. *Daldinia concentrica* (Bolt.) Ces. & DeNot. (*Hypoxylon concentricum*

(Bolt.) Grev. On decaying wood. Common. Wymore; Peru; Plattsmouth; Lincoln.

99. SPHÆRELLA Ces. & DeNot.

193. *Sphærella nigrita* Cooke. On leaves of bur oak (*Quercus macrocarpa*); Lincoln; Milford. Common.

194. *Sphærella spartinæ* Ell. & Ev. (Journal of Myc., IV, p. 97. A new Nebraska species.) On leaves of marsh cord grass (*Spartina cynosuroides*); Lincoln, October 8, 1887.

100. PARODIELLA Speg.

195. *Parodiella perisporioides* (B. & C.) Speg. (*Dothidia perisporioides* B. & C.) On leaves of Psoralea (*Psoralea tenuiflora*); Belmont, July 27; Hat Creek basin, Sioux county, August 2; Thedford, August 7; silverleaf (*Psoralea argophylla*); Belmont, July 26; Lincoln, July 2; tick-trefoil (*Desmodium canadense*); Thedford, August 7. Very common, on the under surface of the leaf; giving it a black, velvety appearance, which, especially on *P. argophylla*, is very striking.

101. AMPHISPHÆRIA Ces. & DeNot.

196. *Amphisphæria incrustans* Ell. & Ev. (n. sp. in lit.) On decaying wood, with *Dendryphium crustaceum* E. & E. (n. sp. in lit.) Milford, November, 1887.

102. MELOGRAMMA Tul.

197. *Melogramma fuliginosum* (M. & N.) Ell. In bark of green ash (*Fraxinus viridis*); Lincoln. Very common.

### 32. HYPOCREACEÆ.

103. NECTRIA Fr.

198. *Nectria sambuci* Ell. & Ev. (n. sp. in lit.) On stems of common elder (*Sambucus canadensis*); Lincoln, August, 1888.

199. *Nectria sphærospora* Ell. & Ev. (n. sp. in lit.) On bark of green ash (*Fraxinus viridis*) ?; Lincoln, November, 1888; honey locust (*Gleditschia triacanthos*); Lincoln, September, 1889. (Ellis says in regard to it: "This is a remarkable species. The asci are at first filled with minute allantoid spores, later with eight biseriate globose spores from 5-7 micromillimetres in diameter. The spores, when free, are surrounded with radiating filaments 8-10 micromillimetres long, and look like little stars.")

104. CLAVICEPS Tul.

200. *Claviceps purpurea* (Fr.) Tul. On wheat grass (*Agropyrum glaucum*), Lincoln; quack grass (*Agropyrum repens*), Thedford, August 7; wild rye (*Elymus canadensis*), Lincoln; marsh cord grass (*Spartina cynosuroides*), Howard county, August. Very common, especially on *Agropyrum glaucum* and *Elymus canadensis*. This is a matter of considerable moment, considering the fact that the former is one of the most common and best of our wild grasses.

104¼. CORDYCEPS Fr.

200¼. *Cordyceps acicularis* Rav. In larva of a beetle of the family *Tenebrionidæ*, probably a *Nyctobates*, West Point, April 26, 1888, (L. Bruner). The specimens are yet immature, the heads bearing the perithecia not having yet formed. The stipe is fuscus, grooved, about eight centimetres long and one millimetre in thickness.

104½. EPICHLOE Fr.

200½. *Epichloe typhina* (Pers.) Tul. On *Bouteloua oligostachya*, Lincoln.

### 33. DOTHIDIACEÆ.

105. PHYLLACHORA Nitschke.

201. *Phyllachora graminis* (Pers.) Fuckel. On leaves of prairie grass (*Sporobolus asperifolius*), Culbertson; Alliance, August 7; Howard county; *Brachyelytrum aristatum*, Cass county; Muhlenberg's grass (*Muhlenbergia racemosa*), Lincoln; Muhlenberg's grass (*Muhlenbergia mexicana*), Lincoln; big blue stem (*Andropogon provincialis*), Lincoln; little blue stem (*Andropogon scoparius*), Lincoln; wild rye (*Elymus virginicus*), Lincoln; rice cut-grass (*Leersia virginica*), Lincoln. An exceedingly common fungus, apparently not very injurious, forming small black spots on the leaves, discolored both above and below.

202. *Phyllachora trifolii* (Pers.) Fuckel. On leaves of red clover (*Trifolium pratense*), Lincoln. P.

106. PLOWRIGHTIA Sacc.

203. *Plowrightia morbosa* (Schw.) Sacc. Plum knot, black knot. On limbs of plum (*Prunus americana*); Lincoln; Belmont, July 26. Cherry (*Prunus virginiana*); Lincoln. Cherry (*Prunus demissa*); Hat Creek basin, Sioux county, August 1. Very common and widespread.

107. OPHIODOTHIS Sacc.

204. *Ophiodothis haydeni* (B. & C.) Sacc. (*Dothidia haydeni* B. & C.) On leaves of aster (*Aster ericoides*); Lincoln.

### 34. HYSTERIACEÆ.

108. HYSTEROGRAPHIUM Corda.

205. *Hysterographium viticolum* (C. & P.) Rehm. On stems of cultivated grape; Lincoln. P.

## *Order Pyrenolichenes.*

### 35. VERRUCARIACEÆ.

109. PYRENULA (Ach., Næg. & Hepp.) Tuck.

206. *Pyrenula punctiformis* (Ach.) Næg. & Hepp.; Lincoln; Weeping Water. W.

207. *Pyrenula fallaciosa* Stiz. On bark of trees; Weeping Water. W.

208. *Pyrenula nitida* Ach. On trees; Weeping Water; South Bend. W.

110. VERRUCARIA Pers., Tuck.

209. *Verrucaria rupestris* Schrad. On rocks; Wymore; Weeping Water; Ashland. W.

210. *Verrucaria rupestris* Schrad. var. *subalbicans* Leight. On limestone; Ashland; Weeping Water; South Bend. W.

111. STAUROTHELE Norm.

211. *Staurothele umbrina* (Wahl.) Tuck. On limestone; Weeping Water; Lincoln.

112. ENDOCARPON (Hedw.) Fr.

212. *Endocarpon miniatum* Ach. Rocks; Valentine. W.

213. *Endocarpon pusillum* Tuck. On lime rocks; Weeping Water. W.

214. *Endocarpon rufescens* Ach. On prairie, rocky hills, etc.; Weeping Water; Wymore. W.

## *Order Discolichenes.*

### 36. GRAPHIDACEÆ.

113. MYCOPORUM (Fl.) Nyl.
   - 215. *Mycoporum pycnocarpum* Nyl. On hickory. Weeping Water. W.

114. ARTHONIA (Ach.) Nyl.
   - 216. *Arthonia asteroidea* Ach. On trees. Lincoln, Weeping Water, Elmwood, Wabash, West Point, Ashland, South Bend, Saltillo. W.
   - 217. *Arthonia dispersa* (Schrad.) Nyl. On various trees. Lincoln, Weeping Water, Saltillo. W.
   - 218. *Arthonia lapidicola* Tayl. On sandstone. Weeping Water. W.
   - 219. *Arthonia punctiformis* Ach. On hickory, hazel, etc. Weeping Water. W.
   - 220. *Arthonia tædiosa* Nyl. On trees. Weeping Water. W.

115. GRAPHIS Ach., Nyl.
   - 221. *Graphis dendritica* Ach. On oak trees. Weeping Water. W.
   - 222. *Graphis scripta* Ach. On trees, elm, hickory, etc. Weeping Water; Wymore; Lincoln. W.
   - 223. *Graphis scripta* Ach. var. *limitata* Schær. On trees. Weeping Water. W.

116. OPEGRAPHIA (Humb.) Ach., Nyl.
   - 224. *Opegraphia varia* Pers. On trees. Weeping Water; Lincoln. W.

### 37. LECIDEACEÆ.

117. BUELLIA DeNot., Tuck.
   - 225. *Buellia albo-atra* (Hoffm.) Th. Fr. var. *saxicola* Fr. On limestone. Valentine. W.
   - 226. *Buellia myriocarpa* (DC.) Mudd. On sandstone. Lincoln; Weeping Water. W.
   - 227. *Buellia parasema* (Ach.) Th. Fr. On trees. Lincoln; Weeping Water; Ashland.
   - 228. *Buellia parmeliarum* (Sommerf.) Tuck. A parasite on the thallus of *Parmelia borreri*. Ashland. W.
   - 229. *Buellia pertusaricola* Willey. Parasitic on the thallus of *Pertusaria pustulata*. Weeping Water; Ashland. W.

118. LECIDEA (Ach., Fr.) Tuck.
   - 230. *Lecidea acclinis* Flot. On trees. Lincoln; Weeping Water. W.
   - 231. *Lecidea cæruleo-nigricans* (Lightf.) Schær. On rocks and earth. Culbertson. W.
   - 232. *Lecidea contigua* Fr. Lime rocks. Culbertson; Valentine. W.
   - 233. *Lecidea enteroleuca* Fr. On rocks. Weeping Water; Lincoln; Long Pine; Valentine; Wymore; Ashland; Culbertson.
   - 234. *Lecidea enteroleuca* Fr. var. *achrista* Sommerf. On trees. Lincoln; Weeping Water.
   - 235. *Lecidea polycarpa* Fr. On rocks. Western and northwestern Nebraska. W.

119. HETEROTHECIUM Flot.
   - 236. *Heterothecium grossum* (Pers.) Tuck. On hickory trees. Ashland. W

120. BIATORA Fr.
   - 237. *Biatora decipiens* (Ehrh.) Fr. On limestone, Weeping Water; Culbertson. W.
   - 238. *Biatora fusco-rubella* (Hoffm.) Tuck. On trees, South Bend. W.

239. *Biatora granulosa* (Ehrh.) Poetsch. Sandy earth, Peru.
240. *Biatora hypnophila* (Turn.) Tuck. Growing over moss on stones. Weeping Water; Ashland. W.
241. *Biatora icterica* Mont. Earth on prairies. Weeping Water; Lincoln; Wymore; Valentine; Culbertson.
242. *Biatora inundata* Fr. Wet rocks. Weeping Water. W.
243. *Biatora rubella* (Ehrh.) Rabenh.. Trees, South Bend. W.
244. *Biatora russellii* Tuck. On earth and rocks, Valentine; Weeping Water. W.
245. *Biatora stigmatella* Tuck. Trees; Saltillo. W.
246. *Biatora suffusa* Fr. On cottonwood; South Bend. W.
247. *Biatora turgidula* (Fr.) Nyl. On trees; West Point. W.
248. *Biatora umbrina* (Ach.) Tuck. Limestone; Ashland; Weeping Water. W.
249. *Biatora varians* (Ach.) Tuck. On trees; Weeping Water.

121. CLADONIA Hoffm.
250. *Cladonia cornuta* (L.) Fr. On ground; Waverly. W.
251. *Cladonia fimbriata* (L.) Fr. Earth, old stumps, etc.; South Bend. W.
252. *Cladonia fimbriata* (L.) Fr. var. *tubæformis* Fr. On sandstone, earth, etc.; South Bend. W.
253. *Cladonia furcata* (Huds.) Fr. On earth; Weeping Water. W.
254. *Cladonia macilenta* (Ehrh.) Hoffm. On old logs; Weeping Water; Milford. W.
255. *Cladonia mitrula* Tuck. On ground; Lincoln; Weeping Water; South Bend; Ashland.
256. *Cladonia pulchella* Schw. On old stumps; Weeping Water. W.
257. *Cladonia pyxidata* (L.) Fr. On earth, stones, etc., especially on sandstone among mosses; Lincoln; Weeping Water; Waverly; Wymore; Ashland; South Bend. W.
258. *Cladonia squamosa* Hoffm. On old logs and earth; Weeping Water. W.
259. *Cladonia symphycarpa* Fr. On earth; Lincoln; Weeping Water. W.

122. GYALECTA (Ach.) Anzi.
260. *Gyalecta lutea* (Dicks.) Tuck. On elm trees; Ashland. W.

### 38. PARMELIACEÆ.

123. PERTUSARIA DC.
261. *Petusaria communis* DC. On trees. Weeping Water. W.
262. *Pertusaria multipuncta* (Turn.) Nyl. On trees. Weeping Water. W.
263. *Pertusaria pustulata* (Ach.) Nyl. On trees. Common. Lincoln; Weeping Water; South Bend; Wymore; Ashland.
264. *Pertusaria velata* (Turn.) Nyl. On trees. Weeping Water; Lincoln.

124. RINODINA Mass., Stizenbr., Tuck.
265. *Rinodina oreina* (Ach.) Mass. On rocks. Lincoln; Wymore; Waverly; Ashland; Weeping Water. Very common.
266. *Rinodina sophodes* (Ach.) Nyl. On trees. Lincoln; Weeping Water; Ashland. W.
267. *Rinodina sophodes* (Ach.) Nyl. var. *exigua* Fr. On trees. Lincoln. W.

125. LECANORA Ach., Tuck.
268. *Lecanora calcarea* (L.) Sommerf. On limestone rocks. Weeping Water. W.

269. *Lecanora chlorophana* (Wahl.) Ach. On rocks. Western and northwestern Nebraska. W.

270. *Lecanora fuscata* (Schrad.) Th. Fr. On sandstone. Weeping Water; Lincoln. W.

271. *Lecanora hageni* Ach. On rocks. Peru.

272. *Lecanora melanaspis* (Wahl.) Ach. Rocks and earth. Northwestern Nebraska. W.

273. *Lecanora muralis* (Schreb.) Schær. On rocks over the state. W.

274. *Lecanora muralis* (Schreb.) Schær. var *garovaglii* Anz. Culbertson. W.

275. *Lecanora muralis* (Schreb.) Schær. var. *saxicola* Schær. Weeping Water; Lincoln. W.

276. *Lecanora muralis* (Schreb.) Schær. var. *versicolor* Fr. Weeping Water. W.

277. *Lecanora rubina* (Vill.) Ach. On rocks. Northwestern Nebraska. W.

278. *Lecanora rubina* (Vill.) Ach. var. *opaca* Ach. Fr. On rocks. New Helena.

279. *Lecanora subfusca* (L.) Ach. On logs, etc. Lincoln.

280. *Lecanora subfusca* (L.) Ach. var. *argentata* Ach. On trees. Weeping Water. W.

281. *Lecanora subfusca* (L.) Ach. var. *coilocarpa* Ach. Weeping Water, Lincoln. W.

282. *Lecanora subfusca* (L.) Ach. var. *distans* Ach. Weeping Water.

283. *Lecanora xanthophana* Nyl. On limestone. Weeping Water; Culbertson; Valentine, and northwestern Nebraska.

283½. *Lecanora xanthophana* Nyl. var. *dealbata* Tuck. On rocks. Ashland; Weeping Water; Valentine. W.

126. PLACODIUM (DC.) Næg. & Hepp.

284. *Placodium aurantiacum* (Lightf.) Næg. & Hepp. Rocks and trees. Common. Peru; Culbertson; Lincoln; Weeping Water.

285. *Placodium cerinum* (Hedw.) Næg. & Hepp. On hickory. Weeping Water. W.

286. *Placodium cerinum* (Hedw.) Næg. & Hepp. var. *pyracea* Nyl. On trees. Saltillo; Weeping Water. W.

287. *Placodium citrinum* (Hoff.) Leight. On rocks and earth. West Nebraska. W.

288. *Placodium ferrugineum* (Huds.) Hepp. var. *pollinii* Tuck. On trees. South Bend. W.

289. *Placodium fulgens* (Sw.) DC. On earth. Northwestern Nebraska. W.

290. *Placodium fulgens* (Sw.) DC. var. *bracteatum* Ach. Calcareous earth. Valentine. W.

127. LEPTOGIUM Fr., Nyl.

291. *Leptogium dactylinum* Tuck. Lime rocks. Ashland; Weeping Water; South Bend. W.

128. COLLEMA Hoffm., Fr.

292. *Collema aggregatum* Nyl. On rocks. Weeping Water. W.

293. *Collema crytaspis* Tuck. On trees. South Bend; Weeping Water; Ashland. W.

294. *Collema flaccidum* Ach. On trees. South Bend; Weeping Water; Ashland; Lincoln.

295. *Collema laciniatum* Nyl. On trees. Weeping Water, Saltillo. W.

296. *Collema leptaleum* Tuck. On trees. Weeping Water. W.

297. *Collema nigrescens* (Huds.) Ach. On trees. Weeping Water. W.

298. *Collema pycnocarpum* Nyl. On trees. South Bend; Weeping Water. W.

129. OMPHALARIA Dur. & Mont.

299. *Omphalaria pulvinata* Nyl. On lime rocks. Ashland; South Bend; Weeping Water. W.

130. PANNARIA Delis.

300. *Pannaria lanuginosa* (Ach.) Koerb. On rocks in wet places. Weeping Water; Ashland; South Bend. W.

301. *Pannaria nigra* (Huds.) Nyl. On limestone. Culbertson; Weeping Water. W.

131. HEPPIA Næg.

302. *Heppia despreauxii* (Mont.) Tuck. On earth. Lincoln. W

303. *Heppia polyspora* Tuck. On earth. Weeping Water. W.

132. PELTIGERA (Willd. Hoffm.) Feé.

304. *Peltigera canina* (L.) Hoffm. On rocks among mosses. Weeping Water; Long Pine; South Bend; Belmont; Ashland.

305. *Peltigera canina* (L.) Hoffm. var. *spuria* Ach. On sandstone. Weeping Water. W.

306. *Peltigera polydactyla* (Neck.) Hoffm. On earth. Weeping Water; Plattsmouth; Lincoln; Belmont.

133. STICTA (Schreb.) Fr.

307. *Sticta aurata* (Sm.) Ach. On rocks. Phelps county. W.

134. UMBILICARIA Hoffm.

308. *Umbilicaria pustulata* (L.) Hoffm. On rocks. Weeping Water; Valentine. W.

309. *Umbilicaria rugifera* Nyl. On rocks. Weeping Water. W.

135. PYXINE Fr., Tuck.

310. *Pyxine sorediata* Fr. On trees and rocks. Lincoln; Weeping Water; Ashland; South Bend. W.

136. PHYSCIA (DC., Fr.) Th. Fr.

311. *Physcia adglutinata* (Floerk.) Nyl. On trees, especially basswood. Weeping Water; Lincoln.

312. *Physcia obscura* (Ehrh.) Nyl. On trees. Weeping Water; Lincoln.

313. *Physcia pulverulenta* (Schreb.) Nyl. On trees, rocks, and earth. Weeping Water: Peru; Lincoln; West Point.

314. *Physcia pulverulenta* (Schreb.) Nyl. var. *leucoleiptes* Tuck. On trees. Weeping Water; Saltillo. W.

315. *Physcia speciosa* (Wulf. Ach.) Nyl. On trees and rocks. Weeping Water.

316. *Physcia stellaris* (L.) Tuck. On trees, stumps, and stones. Very common. Lincoln; Weeping Water; Long Pine; Ashland; West Point; Peru; Belmont; Dismal river, Thomas county; Hat Creek basin, Sioux county.

317. *Physcia tribacea* (Ach.) Tuck. On trees. Weeping Water; West Point. W.

137. PARMELIA (Ach.) DeNot.

318. *Parmelia borreri* Turn. On trees. Common. Peru; Weeping Water; Long Pine; Milford; Ashland; Crete.

319. *Parmelia borreri* Turn. var. *rudecta* Tuck. On trees. Milford; Weeping Water; Long Pine. W.

320. *Parmelia caperata* (L.) Ach. On trees and rocks. Weeping Water; Valentine.

321. *Parmelia colpodes* (Ach.) Nyl. On trees. Eastern Nebraska.

322. *Parmelia conspersa* (Ehrh.) Ach. On rocks. Northwestern Nebraska. W.

323. *Parmelia crinita* Ach. On old tree trunks. Saltillo. W.

324. *Parmelia olivacea* (L.) Ach. On trees. Long Pine; West Point; Weeping Water; Ashland. W.

325. *Parmelia perforata* (Jacq.) Ach. On trees. Weeping Water; Milford; Wymore; Ashland.

326. *Parmelia perforata* (Jacq.) Ach. var. *hypotropa* Nyl. On trees. Milford. W.

327. *Parmelia tiliacea* (Hoffm.) Floerk. On trees, hickory, etc. Milford; Lincoln; Weeping Water.

328. *Parmelia tiliacea* (Hoffm.) Floerk. var. *sulphurosa* Tuck. Weeping Water. W.

138. THELOSCHISTES Norm. emend.

329. *Theloschistes chrysophthalmus* (L.) Norm. On trees. Very common. Weeping Water; Wymore; Peru; Milford; Long Pine; West Point; Anselmo; Belmont; Hat Creek basin, Sioux county; Dismal river, Thomas county.

330. *Theloschistes concolor* (Dicks.) Tuck. On trees. Weeping Water; Lincoln; Ashland; Milford.

331. *Theloschistes concolor* (Dicks.) Tuck. var. *effusa* Tuck. Weeping Water; Lincoln; W.

332. *Theloschistes parietinus* (L.) Norm. On trees. Lincoln; Weeping Water.

333. *Theloschistes parietinus* (L.) Norm. var. *lychneus* (Nyl.) Tuck. On trees. Saltillo; Weeping Water; W.

334. *Theloschistes parietinus* (L.) Norm. var. *polycarpus* (Ehrh.) Tuck. On trees. Weeping Water; Lincoln; Wymore; Ashland; Milford.

139. USNEA (Dill.) Ach.

335. *Usnea barbata* (L.) Fr. On trees. Weeping Water; Lincoln. W.

336. *Usnea barbata* (L.) Fr. var. *florida* Fr. Weeping Water. W.

337. *Usnea barbata* (L.) Fr. var. *hirta* Fr. Weeping Water. W.

140. RAMALINA Ach., DeNot.

338. *Ramalina calicaris* (L.) Fr. On trees, etc. Weeping Water; Lincoln; Ashland. W.

339. *Ramalina calicaris* (L.) Fr. var. *fraxinea* Fr. Weeping Water. W.

## *Order Discomycetes. The Cup-fungi.*

### 39. PEZIZACEÆ.

141. RHYTISMA Fries.

340. *Rhytisma acerinum* (Pers.) Fr. On living leaves of silver or soft maple (*Acer dasycarpum*). Lincoln. Common; forming large thickened black patches.

341. *Rhytisma salicinum* Fr. On leaves of willow (*Salix* sp.). Belmont, July 21; Thedford, August 7.

142. PATELLARIA Fries.

342. *Patellaria atrata* Fr. On decaying wood, etc. Milford.

143. CALLORIA Fries.

343. *Calloria stictiformis* Ell. & Ev. (n. sp. in lit.). On decaying wood. Lincoln.

144. PEZIZA Fuckel.

344. *Peziza wrightii* B. & C. On ground. Lincoln. P.

345. *Peziza vulgaris* Fr. On ground in grass. Lincoln. Not uncommon.

### 40. HELVELLACEÆ.

145. MORCHELLA Dill.

346. *Morchella esculenta* Pers. On ground in woods, near old stumps, etc.; not uncommon. Lincoln; Wymore.

## *Order Uredineæ.*

### 41. UREDINEÆ. THE RUSTS.

146. UROMYCES Link.

347. *Uromyces appendiculatus* (Pers.) Link. Bean rust. II. On wild bean (*Phaseolus pauciflorus*), Nelson. Lincoln. III. On wild bean (*Phaseolus diversifolius*), Lincoln; wild bean (*P. pauciflorus*), Nelson. Not very injurious. Easily recognized by its brownish-black spore dots, equally distributed over the surface of the leaves, giving them a blackish, velvety appearance. Abundant.

348. *Uromyces aristidæ* Ell. & Ev. III. On western beard grass (*Aristida purpurea* Nutt., Lincoln; beard grass (*A. basiramea*), Broken Bow, July 4. Inconspicuous, rare, not injurious.

349. *Uromyces astragali* (Opiz.) Sacc. Loco rust. II. (*Uredo lupini* B. & C.) On one of the locos, a wild pea (*Astragalus molissimus* Torr); Belmont, Dawes county, July 26; Hat Creek basin, Sioux county, August 1; also Red Willow county and Harvard. III. On loco (*A. mollissimus*), Belmont and Hat Creek basin (with the preceding stage); wild pea (*A. adsurgens*), Cheyenne county, August. Forming conspicuous powdery orange-yellow spots or dots on the leaves. Quite abundant in the western part of the state.

350. *Uromyces astragali* (Opiz.) Sacc. var. *lupini* (B. & C.) DeToni. III. On wild lupine (*Lupinis plattensis* Watson), Belmont, Dawes county, July 22. Rare, doing but little damage to the host. In outward appearance similar to the preceding. Limited with the host to the western and northwestern parts of the state.

351. *Uromyces caladii* (Schw.) Farlow. I. (*Æcidium caladii* Schw.) On Indian turnip (*Arisæma triphyllum*), Milford; Weeping Water. Quite injurious; its small, light yellow cups spreading over the entire under surface of the leaf.

352. *Uromyces eriogoni* Ell. & Hark. III. On Eriogonum (*Eriogonium multiceps* Nees.). Hat Creek basin, Sioux county, August 2; Court House Rock, Cheyenne county, August 24. In scapes (stems) rare, not injurious.

353. *Uromyces euphorbiæ* Cooke & Pk. Euphorbia rust. II. On *Euphorbia* or spurge (*Euphorbia serpyllifolia*), Fort Robinson, (in herb. Bessey); spurge (*Euphorbia hypericifolia*), Lincoln, P.; spurge (*Euphorbia heterophylla*), Lincoln; spurge (*Euphorbia petaloidea* Engelm.), Crawford, July 27. III. On spurge (*Euphorbia serpyllifolia*), Ft. Robinson, in herb. Bessey; spurge (*E. heterophylla*), Lincoln; spurge (*E. maculata*), Lincoln; spurge (*E. hypericifolia*), Lincoln; spurge (*Euphorbia*, sp.), Dismal river, Thomas county, July 12; spurge (*Euphorbia marginata* Pursh), Lincoln, October 12. An exceedingly common and widely distributed species, yet seldom very destructive, affecting

both the upper and under surfaces of the leaves, forming little blackish-brown, powdery spots, about the size of a pin head.

354. *Uromyces fabæ* (Pers.) De Bary. I. On leaves of ground-nut (*Apios tuberosa*), Crete, July 4. Forming large yellow conspicuous spots. II and III. On vetchling (*Lathyrus polymorphus* Nutt.), Broken Bow, July 4; Anselmo, July 7; Belmont, July 26; Thedford, July 10. All stages are quite destructive. The first forms large orange-yellow conspicuous spots which soon fall out. Stages II and III are plentiful in the sand hills in the central part of the state and westward, wherever the host is found. Frequently the fungus attacks almost every leaf of a plant, giving the entire plant a sickly yellowish-green color. The leaves of such plants shrivel and soon fall off.

355. *Uromyces graminicola* Burrill. II & III. On leaves of switch grass (*Panicum virgatum*), Lincoln. Not very common, but when occurring usually quite destructive. Another rust occurs on this grass; see *Puccinia emaculata* Schw.

356. *Uromyces hedysari-paniculati* (Schw.) Farlow. II & III. On leaves of tick-trefoil (*Desmodium canescens*), Lincoln. Quite common but not usually very injurious to the host. In outward appearance very similar to No. 347. Its small blackish spore masses, frequently covering the entire surface of the leaf, give it a blackish powdery appearance.

357. *Uromyces junci* (Desm.) Tul. II & III. On bog-rush (*Juncus tenuis*) Broken Bow, July 4. Rare. Not injuring the host to any extent. Spore masses slightly raised, about the size of a pin head, usually widely scattered on both surfaces of the leaf, and on the stems. A parasite (*Darluca filum* (Biv.) Cast.) upon this is apparently quite destructive, as but few spores of the *Uromyces* have matured.

358. *Uromyces lespedezæ* (Schw.) Pk. III. On leaves of bush-clover (*Lespedeza capitata*), Lincoln, Nemaha City. Usually not very injurious, occurring mostly rather late in the season.

359. *Uromyces polygoni* (Pers.) Fuckel. I. On knotgrass or doorweed (*Polygonum aviculare*), Lincoln, May 7. II. On knotweed (*Polygonum ramosissimum*), Lincoln. On knotweed (*Polygonum ramosissimum*), Lincoln; knotgrass (*Polygonum erectum*), Lincoln. A common species, frequently quite destructive.

360. *Uromyces rudbeckiæ* Arthur & Holw. III. On cone-flower (*Rudbeckia laciniata*), Lincoln, October 5. A beautiful light brown species, forming in definite spots, numerous, rather prominent, raised spore masses, on the under surface of the leaf. Very common and destructive. The tissue soon breaks away, leaving holes resembling insect work, or the entire leaf rolls up and soon falls.

361. *Uromyces scirpi* Burrill. II & III. On great bulrush (*Scirpus lacustris*), Weeping Water. Not a common species in Nebraska.

362. *Uromyces terebinthi* (DC.) Winter. II & III. On poison ivy or poison oak (*Rhus toxicodendron*), Belmont, July 18. Very abundant, considerably damaging the host. On both sides of the leaves, on stems, etc. The fungus forms beneath the epidermis, but soon bursts through, forming, especially on the stems, large swollen, powdery patches, much resembling a smut.

363. *Uromyces trifolii* (Alb. & Schw.) Winter f. *glycyrrhizæ* E. & E. III. On wild liquorice (*Glycyrrhiza lepidota*), Lincoln; Anselmo, July 7; Thedford, July 10; Belmont, July 24; Harrison, August 2; Alliance, August 7. Very abundant and widespread in Nebraska. Destructive, frequently withering every plant for rods around. Chiefly on the lower surface of the leaf, spreading to the upper; sori brownish, equally distributed, confluent, frequently occupying almost the entire surface of the leaf. Teleutospores 15–23 by 21–30 micromillimetres.

147. MELAMPSORA Cast.

364. *Melampsora farinosa* (Pers.) Schroet. (*M. salicini* Lev.) II. On heart-leaved willow (*Salix cordata*), Belmont, August 3; willow (*Salix rostrata ?*), Belmont, July 24; black willow (*Salix nigra*), Lincoln. III. On black willow (*Salix nigra*), Lincoln. In stage II on *Salix rostrata* the little spore masses are collected in definite light orange yellow spots which are quite conspicuous. A very common and at times quite destructive fungus.

365. *Melampsora populina* (Jacq.) Lev. Cottonwood rust. II & III. On cottonwood (*Populus monilifera*), Lincoln. Very common. It does not seem to do much injury, as it usually appears rather late in the season.

148. CRONARTIUM Fries.

366. *Cronartium asclepiadeum* (Willd.) Fr. var. *thesii* Berk. II & III. On bastard toad-flax (*Comandra pallida*), Dismal river, Thomas county, July 13; Crawford, July 31; Sioux county, August 2. Quite common and destructive in the central and western parts of the state; it has not yet been noticed in the eastern part. The spore masses are here quite conspicuous and characteristic, forming in cinnamon-colored chains or cones, which resemble short, stubby hairs. These are equally distributed over the surface of the leaf, giving it a rough, hairy, scurfy appearance.

149. PUCCINIA Pers.

367. *Puccinia andropogonis* Schw. Blue stem rust. II. On big blue stem (*Andropogon provincialis*), Kearney county; Lincoln. III. On little blue stem (*Andropogon scoparius*), Kearney county; Thomas county; Lincoln; big blue stem (*Andropogon provincialis*), Thomas county, Kearney county; Lincoln; turkey-foot grass (*Andropogon hallii*), Howard county; Thomas county. On leaves and stems, quite destructive. Very common in autumn.

368. *Puccinia asteris* Duby. III. On aster (*Aster commutatus*), Harrison, Sioux county, August 3. Uncommon, not destructive or conspicuous.

369. *Puccinia caricis* (Schum.) Rabent. II. On sedge (*Cyperus schweinitzii*), Thomas county; Howard county. III. On sedge (*Carex* sp.), Polk county; sedge (*Cyperus schweinitzii*), Thomas county; Howard county. Common, very destructive, covering whole plants. Stage II long, covered by the epidermis, yellow. Stage III erumpent, spore dots linear-oblong. On lower surface of leaves, on culms, etc.

370. *Puccinia convolvuli* (Pers.) Cast. I, II, & III. On leaves of wild morning glory or hedge bindweed (*Convolvulus sepium*), Lincoln. Destructive, common. The first stage is quickly followed by the other two, and frequently the three stages may be found on a leaf at the same time.

371. *Puccinia coronata* Corda. I. (*Æcidium crassum* Pers.) On western buckthorn (*Rhamnus lanceolatus*), Weeping Water; Nebraska City, June. II. On oat (*Avena sativa*), Lincoln, October 13. III. On wheat grass (*Agropyrum glaucum*), Valentine; wood reed grass (*Cinna arundinacea*), Lincoln, October 13; oat (*Avena sativa*), Lincoln, Belmont, Thedford. Quite common. Stage I destructive, in spots, swelling and distorting the leaf; conspicuous. Stage III not destructive, inconspicuous; the spore masses remaining for some time covered by the epidermis of the plant. On leaves and stems or culms.

372. *Puccinia cryptotæniæ* Peck. III. On honewort (*Cryptotænia canadensis*), Lincoln. Rare, not damaging the host in Nebraska. P.

373. *Puccinia emaculata* Schw. II. On switch grass (*Panicum virgatum*), Lincoln. III. On switch grass (*Panicum virgatum*), Lincoln; on old

witch grass (*Panicum capillare*), Lincoln. Chiefly on upper surface of leaves, common, rather destructive. (My specimens on *Panicum virgatum* have the peculiarity mentioned by Burrill, "Pedicels hyaline, a small nuclear spot in each segment.")

374. *Puccinia epilobii* DC. I. On common evening primrose (*Œnothera biennis*), Lincoln.

375. *Puccinia flaccida* B. & Br. II & III. On barnyard grass (*Panicum crus-galli*), Lincoln, October 13. Rare, not noticeably damaging the host. A very peculiar species, marked by the irregularity of its spores, the partition being oblique, or even almost vertical, in which case they greatly resemble a double Uromyces spore. (See Am. Nat., 1890, p. 178.)

376. *Puccinia galii* (Pers.) Schw. I. (*Æcidium galii* Pers.) On cleavers or goose grass (*Galium aparine*), Lincoln. II. On sweet-scented bedstraw (*Galium triflorum*), Belmont, July 18. III. On small bedstraw (*Galium trifidum*), Weeping Water. Not injurious. Rather rare, stages I and III being the most common.

377. *Puccinia giliæ* Ell. & Harkn. II & III. On Gilia (*Gilia longiflora*), Crawford, September 20, 1889. Limited, with the host, to the western part of the state.

378. *Puccinia glechomatis* DC. III. On giant hyssop (*Lophanthus nepetoides*), Lincoln. In herb. Pound.

379. *Puccinia graminis* Pers. Grain rust. I. On common barberry (*Berberis vulgaris*), Lincoln. II. On wheat (*Triticum vulgare*), Lincoln; oat (*Avena sativa*), Lincoln; Anselmo; Belmont; wheat grass (*Agropyrum glaucum*), Thedford, Thomas county, August 7. III. On Ammophila (*Calamagrostis longifolia*) Valentine; Harrison, Sioux county, August 3; Thedford, Thomas county, August 7; wheat grass (*Agropyrum glaucum*), Thedford, Thomas county, August 7; Muhlenberg's grass (*Muhlenbergia racemosa*), Lincoln; oat (*Avena sativa*), Lincoln, October 20; Anselmo; Belmont; blue joint (*Calamagrostis canadensis*), Thomas county; Cheyenne county; Hitchcock county; salt grass (*Distichlis maritima*), Lincoln; Alliance, August 6; wild rye (*Elymus canadensis*), Thedford. A very abundant and destructive species, especially stages II and III.

380. *Puccinia grindeliæ* Peck. III. On fetid gum plant (*Grindelia squarrosa*), Lincoln. Not abundant, but when occurring, quite destructive, contorting and withering the leaves.

381. *Puccinia helianthi* Schw. Sunflower rust. II. On sunflower (*Helianthus lætiflorus*) Lincoln; sunflower (*Helianthus annuus*), Lincoln; sunflower (*Helianthus petiolaris*), Anselmo, July 7; Belmont, August 7. III. On common sunflower (*Helianthus annuus*), Lincoln; sunflower (*Helianthus rigidus*), Lincoln; sunflower (*Helianthus maximiliani*), Lincoln; sunflower (*Helianthus grosseserratus*), Lincoln; sunflower (*Helianthus giganteus*), Lincoln; sunflower (*Helianthus lætiflorus*), Lincoln; sunflower (*Helianthus petiolaris*), Anselmo; Thedford, July 10; Belmont, July 24. Very common and destructive.

382. *Puccinia hieracii* (Schum.) Mart. II. On dandelion (*Taraxicum officinale*), Lincoln.

383. *Puccinia intermixta* Peck. On Iva (*Iva xanthiifolia*), Lincoln. Rare.

384. *Puccinia jonesii* Pk. III. On Musenium (*Musenium tenuifolium* Nutt), Belmont, July 18; Hat Creek basin, Sioux county, August 2. Very abundant where the host occurs (in northwestern part of state), and *very destructive*, frequently destroying large patches, killing leaves and umbels. The spots unite, forming large, irregular, brownish-black patches, resembling a smut. (Of the occurrence of this interesting host in Nebraska there can no longer be any doubt. Numerous

specimens were collected by Dr. Bessey and myself at Belmont in July, 1889, and later, August 2, I found it plentifully in the northwestern part of Sioux county. Specimens were submitted to Dr. Coulter, who confirmed our identification.) Peck (Bot. Gazette, 1881, p. 226,) describes the pedicels of this species as very short. Careful examination of type specimens (Ellis N. A. F., 1448) show the hyaline pedicels to be *very deciduous*, *long*, and *fragile*. It was only by soaking the specimens an hour or so before scraping off the spores to mount that I was able to find the pedicels attached, and even then but seldom. They were usually about seventy-five micromillimetres long. In my fresh Nebraska specimens I find the pedicels frequently attached. They are very long, sometimes being nearly 200 micromillimetres.

385. *Puccinia lateripes* Berk. & Rav. II & III. On Ruellia (*Ruellia ciliosa*), Lincoln. Rare; apparently not very injurious to the host. Very inconspicuous.

386. *Puccinia lycii* Kalchbr. III. On matrimony vine (*Lycium vulgare*), Lincoln. Rare; not destructive. (Mr. Pound reports this as common.)

387. *Puccinia malvastri* Pk. III. On false mallow (*Malvastrum coccineum*), Phelps county; Chadron; Broken Bow, July 24; Belmont, July 25; Alliance, August 6. Quite common and destructive in the central and western parts of the state wherever the host is found. It forms on the leaves distinct, conspicuous, raised, light brown spots.

388. *Puccinia menthæ* Pers. II. On mountain mint or basil (*Pycnanthemum virginicum*), Hall county; wild sage (*Salvia azurea*), Lincoln. III. On wild sage (*Salvia azurea*), Lincoln. Not so common nor so destructive as the next. In appearance it is distinguished from the following by its usually more scattering, less frequent spore dots.

389. *Puccinia menthæ* Pers. var. *americana* Burrill. II. On wild bergamot (*Monarda fistulosa*), Belmont, July 20; Hat Creek basin, August 2; prairie bergamot (*Monarda citriodora* Cerv.), Ft. Robinson, July 31. III. On wild bergamot (*Monarda fistulosa*), Belmont, July 20; Hat Creek basin, August 2; Lincoln. A very common and destructive species. Spore dots usually very thickly scattered over the whole under surface of the leaf, frequently seeming to cover almost the whole surface, giving it a blackish velvety or powdery appearance, mottled with orange-yellow when stage II is present.

390. *Puccinia microsperma* B. & C. (*P. lobeliæ* Gerard). III. On great Lobelia (*Lobelia syphilitica*), Crawford, September 18. Not a very common species. Spore dots small, cinnamon brown, in irregular patches on the lower surface of the leaf. Not destructive.

391. *Puccinia nigrescens* Pk. III. On wild sage (*Salvia lanceolata*), Lincoln, October. Usually very common and destructive from October till the end of the season. Spore dots rather large, black, irregularly scattered, on stems, petioles, leaves, calyx, etc.

391½. *Puccinia obtecta* Peck. On great bulrush (*Scirpus lacustris*), Weeping Water. W.

392. *Puccinia phragmitis* (Schum.) Kornicke. II. On cord grass (*Spartina gracilis*), Camp Clark, Cheyenne county, August. III. On cord grass (*Spartina gracilis*), Camp Clark (with the preceding stage); marsh cord grass (*Spartina cynosuroides*), Lincoln; Geneva. Spore dots prominent, round to linear, on leaves, sheaths, etc. Remains of the epidermis rather prominent especially in stage II. Frequently quite destructive, especially when it attacks the heads or spikes, as it is sometimes observed to do.

393. *Puccinia pimpinellæ* (Straus.) Lk. III. On sweet cicely (*Osmorrhiza longistylis*), Milford. Rare, inconspicuous, not destructive.

394. *Puccinia polygoni* Pers. III. On water persicaria (*Polygonum amphibium*), Lincoln, October 13; Nemaha City, August 25. A very common and destructive species. I seldom go out collecting in the fall without finding some of it.

395. *Puccinia prenanthis* (Pers.) Fuckel. I. On wild lettuce (*Lactuca pulchella*), Belmont, July. (Bessey.) II. On wild lettuce (*Lactuca pulchella*), Lincoln; on blue lettuce (*Lactuca floridanum*), Anselmo, July 6. III. On wild lettuce (*Lactuca pulchella*), Belmont, July; Lincoln; blue lettuce (*Lactuca floridanum*), Anselmo, July 6. (I. Æcidia prominent, hemispherical, opening by a small apical aperture, very thickly scattered on the lower surface of the leaf, frequently on the stem also, but here less common; no genuine pseudo-peridium, but in its place a pseudo-parenchymatous hyphæ-mass; æcidiospores light orange-yellow, subrotund, slightly roughened, usually thick walled, but frequently thin —19–23 micromillimetres. This is probably the *Æcidium hemisphericum* Pk. Bot. Gaz., 1878, p. 34 (Ell. & Ev. N. A. F. No. 2,221), but being found on leaves with typical II and III stages of *Puccinia prenanthis*, having the æcidia hemispherical, opening by a small apical aperture, and lacking the genuine pseudo-peridium, there seems to be no choice but to place it here, although the æcidia are rather large. The æcidiospores agree equally well with the description of either species.) Stage I is, apparently, quite destructive, distorting and variously rolling up the leaves. Stages II and III are typical, rather inconspicuous, not destructive.

396. *Puccina pruni* Pers. Plum rust. III. On plum (*Prunus americana*), Lincoln, October 17.

397. *Puccinia rubigo vera* (DC.) Winter. Wheat rust. II. On wild rye (*Elymus virginicus*), Lincoln, October; wheat (*Triticum vulgare*), Lincoln; squirrel-tail grass (*Hordeum jubatum*), Howard county; barley grass (*Hordeum nodosum*), Thedford, August. III. On wild rye (*Elymus canadensis*), Valley county; Valentine; wild rye (*Elymus virginicus*), Lincoln; Roca; squirrel-tail grass (*Hordeum jubatum*), Lincoln; Howard county; barley grass (*Hordeum nodosum*), Thedford, August; wheat (*Triticum vulgare*), Lincoln. Common, but not very destructive. The spore dots are very small and inconspicuous, remaining long covered by the epidermis. In my Lincoln specimens on wheat the uredo stage is very thickly covered with the little spore-fruits of a parasite (*Darluca filum* (Biv.) Cast.). It appears to be quite injurious to the rust.

398. *Puccinia schedonnardi* Kell. & Swing (Jour. Myc. IV, p. 95). On wire grass (*Schedonnardus texanus*), Broken Bow, July 4. Inconspicuous, possibly common, but it is seldom found. Not very injurious.

399. *Puccinia silphii* Schw. III. On compass-plant (*Silphium laciniatum*), Eagle; rosin-plant. (*Silphium integrifolium*), Weeping Water. In herb. Williams. This is not a very common species here, but when occurring, it is usually quite destructive, its swollen, hemispherical spots much distorting the appearance of the host.

400. *Puccinia sorghi* Schw. Corn rust. II. & III. On Indian corn (*Zea mays*), Lincoln. A very common species, but not noticeably destructive. Spore dots elliptical to linear more or less widely scattered on the leaves.

401. *Puccinia sporoboli* Arthur. II. On prairie-grass (*Sporobolus asper*), Lincoln; prairie grass (*Sporobolus vaginæflorus*), Lincoln, October 13, prairie grass (*Sporobolus cryptandrus*), Crawford, July 29. III. On prairie grass (*Sporobolus asper*), Lincoln; prairie grass (*Sporobolus cryptandrus*), Crawford, July 29; prairie grass (*Sporobolus vaginæflorus*), Lincoln, October 13. Not very common. Apparently not very destructive except, perhaps, on *Sporobolus asper*. (The specimens on

*Sporobolus vaginæflorus* differ considerably from the original description, but posses the peculiarity of bearing one and two celled teleutospores, either in the same sorus, or in different sori without intermixture. II. Uredospores mixed with the teleutospores rotund-elliptical, 34–36 by 30–40 micromillimetres. III. Sori on culms and usually the upper surface of the leaves, prominently surrounded by remains of the ruptured epidermis; teleutospores longer than usually described, 30.4–60.8 by 15–23 micromillimetres; pedicels also longer, usually as long or longer than the spore, 40–70 micromillimetres, almost hyaline. In the one-celled form the spores are also larger than described, 34–45.6 by 19–30 micromillimetres; pedicels ½–2 times as long as the spore, nearly colorless.)

401½. *Puccinia stipæ* Arthur. On porcupine grass (*Stipa comata*), Belmont, July 18.

402. *Puccinia tanaceti* DC. I. On wormwood or sage brush (*Artemisia cana*), Hat Creek basin, Sioux county, August 1; wormwood (*Artemisia canadensis*), Hat Creek basin, August 2. II. On wormwood (*Artemisia cana*), Hat Creek basin, August I. III. On wormwood (*Artemisia cana*), Hat Creek basin; wormwood (*Artemisia dracunculoides*), Lincoln; mountain sage brush (*Artemisia tridentata*), Hat Creek basin, August 2. A very common and destructive species in the northwestern part of the state. Stage I may be questioned as having connection with this species, but I think there can be but little doubt of it. Stages II and III were very common in Sioux county, and on the same plant, and same leaf frequently; stage I occurred also. On plants covered with II and III, frequently injured dried-up spots, as if old *æcidia* (I) occur. This is very likely the *Puccinia* sp. I & III stages found in Colorado in 1886 on *Artemisia mexicana* Willd., by Drs. Bessey and Halstead (Bot. Bull. Ia. Agr. Coll., 1886, p. 58). They inferred a connection between the stages. Mr Anderson, in "Notes on Fungi of Montana," Jour. of Myc. V., p. 33, says, "I have found one of the numerous *Æcidium compositarum* forms occurring with the uredo of *Puccinia tanaceti*, closely followed by the teleutospores. Mr. Cockerell, of Colorado, also infers a possible connection, although not finding the different stages associated on the same plant. Æcidia irregularly scattered on the leaves and stems, light orange-yellow, long (usually about one-half millimetre), somewhat resembling *Rœstelia;* peridial cells subrotund, angular, thick-walled, 15–21 by 19–26 micromillimetres. Æcidiospores orange-yellow, thin-walled, subrotund to elliptical, 11–19 by 17–23 micromillimetres, most commonly 15–19).

403. *Puccinia tanaceti* DC. var. *actinellæ* Webber (n. var.) (see Rusts and Smuts of Nebraska, Bull. Agr. Expt. Station of Nebraska, Vol. I, Art. No. 9, p. 55.) III. On leaves of Actinella (*Actinella acaulis*), Belmont, Dawes county, July 26; Hat Creek basin, Sioux county, August 2, 1889. (Amphigenous, sori more or less clustered, prominent orbicular-elliptical, ½–1 millimetre in diameter, somewhat confluent, frequently surrounded by remains of the ruptured epidermis; teleutospores very variable, broadly ovate-oblong, usually strongly constricted, smooth, thin-walled, 19-38 by 26–76 micromillimetres, mostly about 22 by 50; apex strongly pointed to rounded or truncate, usually somewhat thickened; pedicels hyaline or slightly tinted, robust, from 1–3 times as long as the spore. One and three celled spores occur quite frequently mixed with the normal ones. One celled, 19–26 by 28-53 micromillimetres; three celled, 19–22 by 50–76 micromillimetres. This differs from the normal *P. tanaceti* DC. in the great diversity of its spores and somewhat in the appearance and clustering of the sori and the tinting of the pedicels. It agrees equally well with Peck's *P. viguiereæ* Torr. Bull. XII, p. 35, which is dis-

tinguished from *P. tanaceti* merely by breadth of spores. It is also near *P. variolans* Hark. New. Cal. Fungi, p. 15. The last two it seems to me approach too near *P. tanaceti* to justify specific distinction. Mr. Seymour ("List of Fungi," Pro. Bost. Soc. of Nat. Hist., Vol. XXIV, 1889, p. 188) has referred this to *P. variolans* Hark.) (Figured in Am. Nat. 1890, p. 178, Pl. VII, Fig. 7, *a–n.*) Quite common and destructive in the northwestern part of the state where this host occurs.

404. *Puccinia tanaceti* DC. var. *vernoniæ* (Schw.) Burrill. II. On iron weed (*Vernonia fasciculata*); Anselmo, July 7. III. On iron weed (*Vernonia fasciculata*); Anselmo, July 7; Lincoln. Common, rather destructive. Frequently conspicuously blackening the under surface of the leaf with its numerous small spore dots.

405. *Puccinia thesii* (Desv.) Chaill. I and III. On bastard toad-flax (*Comandra pallida*); Dismal river, Thomas county, July 13, 1889. Amphigenous or mostly hypophyllous, spreading to the upper surface; æcidia on stem, leaves, and fruits, rather prominent whitish, densely crowded on thickened reddish-yellow spots or irregular indefinite patches; peridial cells rather longer than broad, usually 16-21 by 19-27 micromillimetres, strongly rugose or tuberculate; æcidiospores orange-yellow, slightly tuberculate, mostly subrotund 19–23 micromillimetres; sometimes elliptical 19–23 by 19–27 micromillimetres; uredo stage not found; teleutosori scattered on stems and leaves, prominent rotund ¼-¾mm. in diameter, somewhat confluent, conspiciously surrounded by the remains of the ruptured epidermis; teleutospores elliptical-oblong, slightly constricted, smooth, rather thin walled, 17–23 by 32–50 micromillimetres; apex rounded or some what pointed, thickened; pedicels slightly tinted 1–2½ times the length of the spores. I have no hesitation in placing my specimens here, although this species has not been reportéd before from America, and has only been known as occurring on *Thesium*, an old world genus. I have compared my specimens with those of Linhart and De Thuemen and find no noticeable difference (Linhart's Fungi, Hung., 319; De Thuemen's Myc. Univ. 1523.) The *Æcidium* on *Comandra umbellata* and *C. pallida* so common in the west, and commonly referred to *Æcidium pustulatum* Curt., is, in part at least, I think, nothing more than the first stage of this. Whether the original *Æ. pustulatum* is to be considered as belonging here or not, I am in doubt. They are surely very nearly related species. They agree in having reddish-yellow, thickened spots; few honey-yellow, epiphyllous spermogonia; densely crowded æcidia; and slightly tuberculate, same sized æcidiospores. They seemingly disagree in size of æcidia; that of *Æ pustulatum* is described as short, and that of *P. thesii* as long. Of *P. thesii* De-Toni says: "Æcidia as long as 750 micromillimetres;" Winter, "to ¾ millimetre high;" Schroeter, "more or less elongated cyndrical;" Plowright does not mention the length. The æcidia of *Æ. pustulatum* are described by Burrill (Par. Fungi, Ill. Ured., p. 237) as hypophyllous. Specimens distributed by Peck (De Thuemen Myc. Univ. 1424) have a few æcidia on the upper surface of the leaf showing a tendency to spread to that surface, but those distributed in Ellis N. A. F. 224, probably from the same place, do not show this. Kellerman and Swingle's specimens (Kansas Fungi, No. 29) have the æcidia as frequently epiphyllous as hypophyllous (! a western specimen). Thus it seems the difference in habit (epiphyllous or amphigenous) between the two species is of but little value as a differential character. All the difference found may reasonably be attributed to influence of climate and habitat.

406. *Puccinia vexans* Farlow. Gramma rust. II. (*Uredo boutelouæ* Arthur.—In Bull. Iowa Agrl. Coll., 1884). On bristly mesquite or gramma

(*Bouteloua hirsuta*), Crawford, July 28. III. On gramma (*Bouteloua oligostachya*), Lincoln; Dundy county; mesquite grass (*Bouteloua racemosa*), Polk county; Howard county; bristly mesquite grass (*Bouteloua hirsuta*, Lincoln; Crawford, July 28. A common but not very destructive species. (I have no hesitation in placing *Uredo boutelouæ* Arthur, as stage II of this species, having several times found the uredospores and teleutospores in the same sorus. Dr. Arthur suspected a connection and first described it as the uredo stage of *Uromyces brandegei* Pk. (See Bull. Minn. Acad. Nat. Sci. II.) Both the one and two celled teleutospore forms are common. My Crawford specimens are of the rugose type and have the pedicels somewhat tinted.

407. *Puccinia violæ* (Schum.) DC. Violet rust. I. On common blue violet (*Viola cucullata*), Lincoln; Ft. Robinson; larkspur violet (*Viola delphinifolia*), Lincoln; prairie violet (*Viola nuttallii*), Valentine. III. On common blue violet (*Viola cucullata*), Lincoln; larkspur violet (*Viola delphinifolia*), Lincoln. Quite a common species, the first stage of which is frequently destructive.

408. *Puccinia windsoriæ* Schw. Muhlenberg rust. II & III. On Muhlenberg's grass (*Muhlenbergia racemosa*), Lincoln, October 13. Very abundant and destructive this year. I had not noticed it before. Spore dots very numerous, blackish on the lower surface of the leaf.

409. *Puccinia xanthii* Schw. Cocklebur rust. III. On great ragweed (*Ambrosia trifida*), Lincoln; Roman wormwood (*Ambrosia artemisiæfolia*), Lincoln; common cocklebur, (*Xanthium canadensis*, Lincoln. Quite common and destructive, forming numerous, large, cinnamon-colored, swollen spots on the lower surface of the leaves.

410. *Puccinia* sp. Buffalo-grass rust. II & III. On buffalo grass (*Buchloe dactyloides*), Lincoln, October, 1886. Rare. Not destructive. (Amphigenous, or mostly hypophyllous. Sori elliptical-oblong, small, irregularly scattered, soon naked, the remains of the ruptured epidermis hardly conspicious; uredospores subglobose, smooth, 14–21 by 21–23 micomillimetres; teleutospores oblong-elliptical or slightly obovate, light brown, smooth, usually thin walled, 15–23 by 29–40 micromillimetes; apex obtusely rounded, slightly, if any, thickened; pedicels hyaline, rather robust, from 1–2½ times as long as the spores. On leaves and culms of *Buchloe dactyloides*, collected by J. G. Smith near Lincoln in 1886. This species was examined by Mr. Schofield, a student of the University of Nebraska, in the winter of 1887, and sent to Dr. Farlow for examination under the name *Puccinia buchloes*. We have as yet no answer. It is closely related to *P. vexans* Farlow, and may prove to be that species.)

150. UROPYXIS Schroet.

411. *Uropyxis amorphæ* (Curt.) Schroet. (*Puccinia amorphæ* Curt.) II. On false indigo (*Amorpha fruticosa*), Lincoln. III. On lead plant (*Amorpha canescens*), Lincoln. On false indigo (*Amorpha fruticosa*), Lincoln. Usually rather uncommon and not very destructive. In the fall of 1888 I found it, however, quite common on the lead plant, and apparently very injurious, as whole plants affected with it presented a withered appearance.

412. *Uropyxis petalostemonis* (Farl.) De Toni (*Puccinia petalostemonis* Farl.). II. On white prairie clover (*Petalostemon candidus*), Belmont, Dawes county, July 24. III. On red prairie clover (*Petalostemon violaceus*), Lincoln. Very plentiful in northwestern Nebraska, in patches destroying almost every plant. Found but rarely in the eastern part of the state.

151. GYMNOSPORANGIUM Hedwig.

413. *Gymnosporangium clavariæforme* (Jacq.) Rees. I. On service-berry or June-berry (*Amelanchier alnifolia*), Hat Creek basin, Sioux county, August 1; black or pear thorn (*Cratægus tomentosa*), Lincoln. In herb. Pound. (Since the publication of my List of the Rusts and Smuts of Nebr., Dr. Thaxter has examined specimens of this and pronounced my identification correct.)

414. *Gymnosporangium macropus* Link. "Cedar apple." III. On red cedar (*Juniperus virginiana*), Lincoln; Fremont. Common, frequently quite destructive, forming on the stems, round, brownish balls with small, finger-like projections, which when wet are large and conspicuous.

152. PHRAGMIDIUM Link.

415. *Phragmidium potentillæ* (Pers.) Karst. II & III. On cinque-foil (*Potentilla hippiana*), Belmont, Dawes county, July 25. A very beautiful species, not frequently occurring. Rather injurious to host. Stage II, light orange yellow; III, black; the two when associated on the same leaf forming a striking contrast.

416. *Phragmidium speciosum* Fr. Rose rust. II. On rose (*Rosa arkansana*), Lincoln; rose (species?), Anselmo, July 6. III. On rose (*Rosa arkansana*), Lincoln; rose (species?), Belmont, July 26. Not very common. Stage II forms a yellow powder on the lower surface of the leaves; and III, forms black knots on the stems.

153. COLEOSPORIUM Lev.

417. *Coleosporium solidaginis* (Schw.) Thuem. Golden rod rust. II. On golden-rod (*Solidago arguta*), Lincoln; golden-rod (*Solidago canadensis*), Lincoln; golden-rod (*Solidago rupestris*), Lincoln. III. On golden-rod (*Solidago canadensis*), Lincoln; golden-rod (*Solidago rupestris*), Lincoln. A very common and frequently destructive species.

418. *Coleosporium sonchi* (Pers.) Lev. II. On aster (*Aster ericoides*), Lincoln; aster (*Aster lævis* var. *lævigatus*), Weeping Water; aster (*Aster macrophyllus*), Lincoln; aster (*Aster sagittifolius*), Hat Creek basin, Sioux county, August 2. Common, not very destructive.

154. PUCCINIASTRUM Otth.

419. *Pucciniastrum epilobii* (Chaill.) Otth. (*Melampsora epilobii* (Pers.) Fuckel. II. On willow-herb (*Epilobium coloratum*), Hat Creek basin, Sioux county, August 2. Rather destructive, but does not occur very commonly. (Sori amphigenous, scattered, plentiful,—described usually as hypophyllous.)

155. ÆCIDIUM Pers.

420. *Æcidium abundans* Pk. On wolf berry (*Symphoricarpos occidentalis*), Hat Creek basin, Sioux county, August 3. A rare species; when occurring, quite destructive. Spore cups in spots on the lower surface of the leaf, the upper surface discolored light brown, or sometimes yellow or reddish.

421. *Æcidium æsculi* Ell. & Holw. On common horse chestnut (*Æsculus hippocastanum?*), Lincoln. Rare, not destructive.

422. *Æcidium apocyni* Schw. On Indian hemp or dogbane (*Apocynum cannabinum*), Lincoln. Not common nor destructive.

423. *Æcidium asterum* Schw. On aster (*Aster sagittifolius*), Wymore. Occurring but rarely.

424. *Æcidium brandegei* Pk. On whorled milkweed (*Asclepias verticillata* var. *pumila*), Crawford, July 29; milkweed (*Asclepias arenaria*), Long Pine. In herb. Bessey. A rare species; on stems and leaves, distorting and swelling the host. Destructive.

425. *Æcidium cassiæ* Ell. & Kell. On partridge pea (*Cassia chamæcrista*), Lincoln. A rare species. P.

426. *Æcidium ceanothi* Ell. & Kell. On red-root (*Ceanothus ovatus*), Lincoln. Common. Rather destructive.

427. *Æcidium clematidis* DC. Clematis rust. On virgin's bower (*Clematis ligusticifolia*), Ft. Robinson, (in herb. Bessey); Dismal river, Thomas county, July 13; Belmont, July 18. Very common and destructive wherever the host occurs.

428. *Æcidium convallariæ* Schum. On great Solomon's seal (*Polygonatum giganteum*), Lincoln; false Solomon's seal (*Smilacina stellata*), Lincoln. Common. Frequently quite destructive.

429. *Æcidium compositarum* Mart. var. ——. On golden ragwort (*Senecio aureus*), Valentine.

430. *Æcidium compositarum* Mart. var. *eupatorii* (Schw.) Burrill. On Joe Pye weed (*Eupatorium purpureum*), Anselmo, Custer county, July 6. Not common. In definite spots, conspicuous, especially above.

431. *Æcidium compositarum* Mart. var. *helianthi* Burrill. On sunflower (*Helianthus doronicoides*), Wymore. Rare; not very destructive here.

432. *Æcidium compositarum* Mart. var. *lactucæ* Burrill. On wild lettuce (*Lactuca canadensis*), Lincoln.

433. *Æcidium compositarum* Mart. var. *liatridis* Webber n. var. (See Rusts and Smuts of Nebr., Bull. Agr. Expt. Station of Nebr., vol. I, art. No. 9, p. 60.) On blazing-star (*Liatris scariosa*), Anselmo, July 9; Belmont, July 25. Not uncommon. Destructive. (Amphigenous, or mostly hypophyllous; spots rather indefinite, thickened, usually occupying the whole width of the leaf and spreading from the upper and lower edges; æcidia in the middle of the spot crowded, on the edges becoming scattered, short, protruding but little, early breaking away, leaving the conical raised epidermal border with a nearly regular apical opening; æcidiospores light orange-yellow, smooth, suborbicular-elliptical, 14–21 by 19–26 micromillimetres, when orbicular usually about 18–22.)

434. *Æcidium compositarum* Mart. var. *lygodesmiæ* Webber n. var. (See Rusts and Smuts of Nebr., Bull. Agri. Expt. Station of Nebr., vol. I, art. No. 9, p. 61.) On Lygodesmia (*Lygodesmia juncea*), Belmont, Dawes county, July 26. A common form here. Very destructive, frequently distorting the whole plant, and by partially stopping the growth above, giving it a depressed, much branched appearance. (Amphigenous on leaves and stems; æcidia prominent, slightly hemisperical, opening by a small apical aperture; on the leaves somewhat clustered, or irregularly scattered; on the stems, crowded in usually elongated, distorted, thickened, patches; peridial cells angular-elliptical, usually strongly tuberculate; æcidiospores light orange yellow, slightly tuberculate, wall of medium thickness, subrotund-elliptical or ovate 20–23 by 22–27 micromillimetres; spermogonia not observed.) All specimens gathered are accompanied by two parasites (upon this parasite), *Darluca filum* (Biv.) Cast., and *Tuberculina persicina* (Ditm.) Sacc. The latter is very destructive, its smooth, violet colored spores completely filling up fully half of the pseudo-peridia, and injuring many more, destroying and taking the place of the æcidiospores.

435. *Æcidium corydalis* (E. & K.) Webber. (*Æcidium dicentræ* Trelease f. *corydalis* Ell. & Kell. In Ell. & Ev., N. A. F., vol. XV, No. 1435. Issued in 1885. *Æ. fumariacearum* Kell. & Swingle, Jour. of Myc., Sept., 1888, p. 95. On leaves of golden corydalis (*Corydalis aurea*). Rare. Lincoln.

436. *Æcidium daleæ* Kell. & Swing. On dalea (*Dalea laxiflora*), McCook; Anselmo, July 6. Rare. Not usually very destructive.

437. *Æcidium erigeronatum* Schw. On daisy fleabane (*Erigeron strigosus*), Lincoln; horse-weed or butterweed (*Erigeron canadense*), Lincoln, July 14. A very common and destructive species.

438. *Æcidium euphorbiæ* Gmel. On spurge (*Euphorbia sp.*), Long Pine (in herb. Bessey); Lincoln; Custer county; Thomas county; spurge or snow-on-the-mountain (*Euphorbia marginata*), Lincoln, May 28. A rather common species. Frequently destructive.

439. *Æcidium fraxini* Schw. Ash rust. On green ash (*Fraxinus viridis*), Lincoln; Anselmo, July 6. Some seasons very common and destructive; again apparently rare for several seasons.

440. *Æcidium grossulariæ* Schum. Gooseberry rust. On gooseberry (*Ribes rotundifolium*), Lincoln; Wymore; Weeping Water. A very common and frequently destructive species.

441. *Æcidium hibisciatum* Schw. On halberd-leaved rose mallow (*Hibiscus militaris*), Weeping Water.

442. *Æcidium hydrophylli* Pk. On waterleaf (*Hydrophyllum virginicum*), Weeping Water.

443. *Æcidium impatientis* Schw. On pale touch-me-not (*Impatiens pallida*), Dismal river, Thomas county, July 15. Very destructive, on petioles, stems, and leaves, variously swelling and distorting them.

444. *Æcidium iridis* Gerard. Iris rust. On common blue flag (*Iris versicolor*), Nebraska City.

445. *Æcidium jamesianum* Pk. On common milkweed (*Asclepias syriaca* L.), Anselmo, July 6; Broken Bow, July 4; milkweed (*Asclepias arenaria*), Dismal river, Thomas county, July 12; Belmont July 25. Very destructive, especially on *Asclepias arenaria*, distorting and rolling up the leaves of entire plants. In the eastern part of the state I have found this but rarely. In the "sand hills" and "bad lands," from central to western Nebraska, I found it in 1889 very common, affecting almost every plant.

446. *Æcidium lepidii* Tracy and Gal. On wild pepper grass (*Lepidium intermedium*), Lincoln. Rare.

447. *Æcidium lysimachiæ* (Schlecht.) Wallr. On loosestrife (*Steironema ciliatum*), Lincoln; Anselmo, July 6. Not noticeably injurious.

448. *Æcidium oxalidis* Thuem. On violet wood-sorrel (*Oxalis violacea*), Lincoln; Weeping Water. Rare. Mr. Williams reports this as common last year (1889) at Weeping Water.

449. *Æcidium pammelii* Trel. On spurge (*Euphorbia corollata*), Weeping Water. (In herb. Pound.) Spurge or snow-on-the-mountain (*Euphorbia marginata*), Anselmo, July 6.

450. *Æcidium peckii* DeToni. (*Æcidium œnotheræ* Pk.) On evening primrose (*Œnothera serrulata*), Lincoln; Anselmo, July 6; evening primrose (*Œnothera biennis*), Lincoln.

451. *Æcidium pentstemonis* Schw. Pentstemon rust. On pentstemon (*Pentstemon cobæa*), Lincoln; pentstemon (*Pentstemon cæruleus*), Antelope county; pentstemon (*Pentstemon grandiflorus*), Lincoln; Anselmo, July 6; pentstemon (*Pentstemon glaber*), Weeping Water; Broken Bow, July 4; Anselmo, July 6; Belmont, July 18; Fairbury, May 24. A very plentiful and destructive species.

452. *Æcidium polemonii* Pk. On phlox (*Phlox pilosa*), Weeping Water.

453. *Æcidium porosum* Pk. On vetch or tare (*Vicia americana* var. *linearis*), Lincoln. Common. Quite destructive.

454. *Æcidium psoraleæ* Pk. On psoralea (*Psoralea tenuiflora*), Lincoln; silver-leaf (*Psoralea argophylla*), Lincoln.

455. *Æcidium punctatum* Pers. On tall meadow-rue (*Thalictrum purpuras-*

*cens*), Lincoln. Spore cups equally distributed over the lower surface of the leaf, thus distinguished from *Æcidium sommerfeltii* Johanson, (*Æ. thalictri* Grev.,) with which it is often confounded.

456. *Æcidium pustulatum* Curt. (See *Puccinia thesii.*) On bastard toad-flax (*Comandra umbellata*), Lincoln. Common, rather destructive.

457. *Æcidium ranunculacearum* DC. On long-fruited anemone (*Anemone cylindrica*), Belmont, July 19. Common, rather destructive. Spore cups in definite spots.

458. *Æcidium ranunculi* Schw. On small-flowered crowfoot (*Ranunculus abortivus*), Lincoln. Rare. Spore cups equally distributed over the surface of the leaf, thus easily distinguished from the preceding on a related host.

459. *Æcidium sambuci* Schw. Elder rust. On common elder (*Sambucus canadensis*), Lincoln. Common, very destructive, greatly swelling and distorting large patches on the stems and leaves.

460. *Æcidium smilacis* Schw. On greenbrier (*Smilax hispida*), Milford; carrion-flower (*Smilax herbacea*), Anselmo, July 6. Quite abundant and destructive, especially on the latter host, forming on the leaves large distorted spots which soon decay and fall out. Also attacking and destroying young fruits.

461. *Æcidium sommerfeltii* Johanson (*Æ. thalictri* Grev.) On tall meadow-rue (*Thalictrum purpurascens*), Lincoln; Belmont, July 18, Not so common as the other species on this host. Spore cups in definite spots. Not very injurious.

462. *Æcidium urticæ* Schw. Nettle rust. On nettle (*Urtica gracilis*), Lincoln. I have found this but once in Nebraska. In the spring of 1885 it was very common and destructive.

463. *Æcidium verbenæ* Speg. Verbena rust. On prostrate vervain or verbena (*Verbena bracteosa*), Lincoln; hoary vervain (*Verbena stricta*), Lincoln; Anselmo; nettle-leaved or white vervain (*Verbena urticifolia*), Weeping Water. Common, frequently quite destructive.

464. *Æcidium xanthoxyli* Pk. Prickly ash rust. On prickly ash (*Xanthoxylum americanum*), Weeping Water. On young fruits, destroying them. It also attacks the leaves.

156. Uredo Pers.

465. *Uredo agrimoniæ* (DC.) Schroet. On common agrimony (*Agrimonia eupatoria*), Belmont, Dawes county, July 20. Quite plentiful, frequently covering almost the whole lower surface of the leaf. Apparently not very injurious.

466. *Uredo cæoma-nitens* Schw. (*Cæoma luminatum* Schw.) Blackberry rust. On blackberry (*Rubus villosus*), Lincoln; black raspberry (*Rubus occidentalis*), Nebraska City, June. Very destructive. Conspicuous, covering the whole lower surface of the leaf with a dense orange-red powder (the spores).

## *Order Ustilagineæ.*

### 42. USTILAGINEÆ.—THE SMUTS.

157. Ustilago Pers.

467. *Ustilago andropogonis* Kell & Swing. Blue stem smut. On big blue stem (*Andropogon provincialis*), Thedford, July 15; Anselmo, July 6; turkey-foot grass (*Andropogon hallii*), Dundy county, August. A common and destructive species, in the spikelets, destroying them, and forming a cylindrical black mass of spores; 7–10 millimetres long, 2–3 millimetres wide. Very near to *Sorosporium ellisii* Winter, if in-

deed it is to be distinguished from it. See in this list No. 487, and Seymour's "List of Fungi collected along the Northern Pacific railroad." Pro. Bost. Sc. Nat. Hist., Vol. XXIV, 1889. (Spores reddish brown, subglobose, slightly roughened, 9-17 by 9.5-21 micromillimetres.)

468. *Ustilago cesatii* Fisch. de Wald. (*Ustilago syntherismæ* Schw.) Sandbur smut. On sandbur (*Cenchrus tribuloides*), Lincoln, November 10. Common. It attacks the head of the grass, forming a black cylindrical spore mass covered by a papery membrane, which soon breaks away. Very destructive, frequently killing every head in large patches of the host plant. (Spores brownish, smooth, round, or sometimes polygonal; 7–12 micromillimetres.)

469. *Ustilago echinata* Schroeter. On reed canary grass (*Phalaris arundinacea*), Lincoln, September. A rare species, but when occurring, quite destructive to the tissue of the leaves, and destroying the heads. (Spores echinulate, orbicular, sometimes [but seldom] ovate or elliptical; 14–18 micromillimetres in diam., when ovate or elliptical, 18-19 micromillimetres long.)

470. *Ustilago hypodytes* (Schlecht.) Fr. (*Ustilago minima* Arthur.) On porcupine grass (*Stipa comata*), Belmont, Dawes county, July 26. A rare species. Usually in the outer tissue of the stem, beneath the leaf sheath, appearing above the sheath as a black powder on the stem. Also destroying the head or needles and seeds of the grass by attacking the head stem (*rachis*) and stopping its growth, converting it into a seemingly long cylindrical blackish spore mass. (Spores reddish brown, smooth, rotund or subrotund, somewhat angular, small 3.5–5 or 6 micromillimetres in diam.) (*Ustilago minima* Arthur, Bull. Iowa Agrl. Coll., 1884, p. 172, must very probably be considered as belonging here. Apparently the only difference between the two species is in the portions of the plant attacked, *Ustilago hypodytes* attacking the culms and *Ustilago minima* the inflorescence. In specimens of *U. minima* [in herb. Bessey] identified by Arthur, the fungus attacks the rachis of the spike and destroys it as in my specimens, and it as frequently attacks the culms also beneath the leaf sheaths. The destruction of the inflorescence is in both cases secondary, and is caused by the destruction of the upper culms or rachis. I have compared both my own specimens and those of Arthur with De Thuemen, Myc. Univ. 820 and 1818; De Thuemen, Herb. Mycol. Oecon. 162; Linhart Fung. Hung. 104; and find no noticeable characteristic difference.)

471. *Ustilago lineata* Cke. On wild rice (*Zizania aquatica*), Howard county, September. Not an uncommon species. Produced in the tissue of the leaves, forming short, line-like, bluish black patches, which remain covered by the epidermis of the leaf. The patches are rather inconspicuous, but show on both sides of the leaf. Not very destructive. (Spores irregular, orbicular, often elliptical or polygonal, smooth, lightish brown; 6–9 micromillimetres in diameter.)

472. *Ustilago maydis* (DC.) Corda. (*U. zeæ mays* Wint.) Corn smut. On Indian corn (*Zea mays*). Common wherever corn is grown. Its appearance is too well known.

473. *Ustilago neglecta* Niessl. Foxtail smut. On yellow foxtail (*Setaria glauca*), Lincoln; green fox-tail (*Setaria viridis*), Lincoln. Very common and destructive, converting the seeds into a black mass of powdery spores. (Spores light brown, echinulate, globose-elliptical, or ovate; 7–11 by 9–16 micromillimetres.)

474. *Ustilago panici-miliacei* (Pers.) Wint. (*U. destruens* (Duby) Schlecht. On old witch grass (*Panicum capillare*), Lincoln, October 6. Common, destroying the heads of the grass similar to *Ustilago cesatii*, No. 468. (Spores brown, irregular, roundish, sometimes polygonal, smooth or

slightly roughened; 7–11 micromillimetres in diameter. See Ellis & Evh. N. A. Fungi, 2260.)

475. *Ustilago parlatorei* Fisch de Wald. Dock smut. On pale dock (*Rumex britannica*), Lincoln, May 14, 1889. Somewhat rare. When occurring it is very destructive. In petioles (leaf stems) and stems, variously swelling and distorting the host. The purple, powdery spore mass, replacing the destroyed inner tissue, gives the stems, etc., the appearance of being stuffed. In places it ruptures the epidermis, and spreading the ruptured edges, forms conspicuous, large, elongated, purple, powdery patches. (Spores, globose or subglobose, reticulated light purple; 9–16 micromillimetres in diameter. A German species not before reported from America.)

476. *Ustilago rotundata* Arthur. On switch grass (*Panicum virgatum*), Lincoln, October. Somewhat rare. Produced in the seeds, destroying them. It does not affect the external appearance of the head or flower, therefore inconspicuous and hard to find. (Spores commonly orbicular, sometimes ovate, dark, very finely echinulate; large, 18–20 micromillimetres in diameter.)

477. *Ustilago segetum* (Bull.) Dittm. Grain smut. On wheat (*Triticum vulgare*), Lincoln; oats (*Avena sativa*), Lincoln; Crete; Belmont, July 19. Too common everywhere. Destroys the grain, replacing it with a black powder (the spores).

478. *Ustilago sorghi* (Link.) Pass. Sorghum smut. On Millo maize (*Andropogon sorghum* var. *vulgaris*), grown on Experiment Station farm. Collected by J. G. Smith, September, 1889. Very destructive, attacking the seeds and converting them into an elongated, ovate column of spores (about 5 millimetres long by 2½ millimetres wide), surrounded by a rather firm, thickish membrane. (Spores subrotund, smooth, 6–8 micromillimetres in diameter.)

479. *Ustilago spermophora* B. & C. On stink or candy grass (*Eragrostis major*), Lincoln, October. Attacks the seeds, giving them a round or elliptical swollen appearance. Not a very common or destructive species here. (Spores orbicular or elliptical, dark purple, finely echinulate; 7–9 micromillimetres in diameter; when elliptical, as much as 10 micromillimetres long).

480. *Ustilago sphærogena* Burrill. On barn-yard grass (*Panicum crus-galli*), Lincoln, October. In Nebraska a rare species. Attacking the seed, it converts them into large roundish or somewhat egg-shaped (ovate) balls from 3 to 5, or when ovate 6, millimetres in diameter. Quite destructive to the injured heads, frequently killing every seed. (Spores slightly echinulate or verrucose, brownish, orbicular or suborbicular; 7–9 micromillimetres in diameter.)

481. *Ustilago utriculosa* (Nees) Tul. On smartweed (*Polygonum pennsylvanicum*), Lincoln, September 29. A somewhat rare species. Destructive when occurring. Produced in the seeds, swelling them, and forming within the seed coat, which soon bursts, a purple powdery mass of spores. (Spores orbicular, spinulose, reticulated, purplish, 7–9 micromillimetres in diameter.)

158. TILETIA Tul.

482. *Tiletia fœtens* (B. & C.) Trel. (*T. lævis*, Kueh. *Ustilago fœtens* B. & C. in Ravenel's Fungi Carol. Exsicc., V. 100, 1860.) Stinking smut or bunt. On wheat (*Triticum vulgare*), Lincoln; St. Paul; Custer county; Red Willow county; and probably throughout the state. A very, common species. Produced in the grain of the wheat, destroying it. (Spores dull brown, rather thick walled, subrotund, ovate or elliptical, 15–20 micromillimetres in diameter; when elliptical, 15–18 by 20–23 micromillimetres; contents very coarsely granular.)

159. **Entyloma** De Bary.

483. *Entyloma compositarum* Farlow. On golden ragwort (*Senecio aureus*), Linçoln, May 27. In the tissue of the leaves. Not very common or destructive. In herb. Bessey.

484. *Entyloma physalidis* (Kalchbr. & Cke.) Wint. On ground cherry (*Physalis lanceolata*), Lincoln, October 13. Not uncommon; usually not very destructive. In roundish spots, 2-7 millimetres in diameter. On the lower surface of the leaves they are whitish, on the upper surface brownish. (Spores light colored, orbicular, smooth; 9.5-14 micromillimetres; epispore rather thick, sub-hyaline.

.160. **Sphacelotheca** De Bary.

485. *Sphacelotheca hydropiperis* (Schum.) De Bary. Smartweed smut. On smartweed (*Polygonum hydropiper*), Lincoln, October 10. Very common and destructive. In the seeds, flowers, etc., forming a somewhat irregular, pointed, ovate (egg-shaped), violet black spore mass, about five millimetres in length. These spore masses, in adjoining flowers, run together, more or less, frequently forming of the entire spike or flower head a very irregular, elongated, contorted spore mass. (Spores orbicular-elliptical, somewhat irregular, smooth, or slightly roughened; 7-11 micromillimetres.)

161. **Doassansia** Cornu.

486. *Doassansia alismatis* (Nees) Cornu. On water plantain (*Alisma plantago* var. *americanum*), Weeping Water. Spots on the leaves and stems, roundish, yellowish, crowded with brown dots. Rare in Nebraska. P.

162. **Sorosporium** Rud.

487. *Sorosporium ellisii* Wint. var. *occidentalis* Seymour. "List of Fungi." Pro. Bost. Soc. Nat. Hist., Vol. XXIV, 1889, p. 190. Blue-stem smut. On big blue stem (*Andropogon provincialis*), Lincoln, October, 1888. Common and destructive. In the secondary heads or spikelets of the grass, converting them into an elongated, cylindrical spore mass, 8-20 millimetres long by 3-4 millimetres wide, having much the appearance of the ergot of rye. This is inclosed in a light brown, papery membrane, which finally bursts and falls away (in part, at least). (Spores subglobose, slightly roughened, 7.6-9.5 by 7.6-11.4 micromillimetres.) Specimens of this referred to Kellerman were pronounced to be *Ustilago andropogonis* K. & S. Whether this species is to be distinguished from *Sorosporium ellisii* or not, I am unable to decide. What seem to be two different forms are found here. My specimens on *Andropogon provincialis* from Thedford and Anselmo agree perfectly with the description of *Ustilago andropogonis* K. & S. Those from Lincoln have smaller spores and agree well with Seymour's description of *Sorosporium ellisii* var. *occidentalis*.

488. *Sorosporium ellisii* Wint. var. *provincialis* Ell. & Ev. (Ell. & Ev. N. A. F. No. 2425.) On big blue stem (*Andropogon provincialis*), Broken Bow, Custer county, July 4, 1889. Common, destroying the spikes. In outward appearance it much resembles typical specimens of *S. ellisii* Wint., but differs greatly in microscopic characters. (Spores smooth, irregular, subrotund to elliptical, small, 5.7-9.5 by 7.6-11.4 micromillimetres.) This is the form placed questionably under *Sorosporium ellisii* in my enumeration of the rusts and smuts of Nebraska (Bull. Agri. Expt. Station of Nebraska, Vol. I, Art. No. 9, p. 72.)

## *Order Gymnomycetes.*

### 43. EXOASCEÆ.

163. **Exoascus** Fuckel.

489. *Exoascus deformans* (Berk.) Fuckel. On peach leaves and plums, Lincoln. Common, frequently doing considerable damage.

## *Order Saccharomycetes.*

### 44. SACCHAROMYCETES.

164. SACCHAROMYCES.

490. *Saccharomyces apiculatus* Reess. In grape juice, common. Lincoln.

491. *Saccharomyces cerevisiæ* Meyen. The yeast plant which produces the fermentation of "yeast." Common in fermenting juices. Lincoln.

492. *Saccharomyces conglomeratus* Reess. In grapes beginning to decay. Lincoln. P.

493. *Saccharomyces ellipsoideus* Reess. In fermenting grape juice, very common. Lincoln.

494. *Saccharomyces minor* Engel. In sour dough. Lincoln. P.

495. *Saccharomyces pastorianus* Reess. In juice of apple. Lincoln. P.

496. *Saccharomyces sphæricus* Sacc. In juice of tomato. Lincoln. P.

### 45. STERILE FORMS.

(Supposed to be stages of Ascomycetes.)

165. SCLEROTIUM Tode.

497. *Sclerotium durum* Pers. On decaying stems of *Hibiscus esculentus*; rare. Lincoln. P.

166. RHIZOMORPHA Roth.

498. *Rhizomorpha subcorticalis* Pers. Under bark of old logs, etc., common. Lincoln. (Almost certainly known to be a stage of *Armillaria mellea* Vahl.)

167. RHIZOCTONIA DC.

499. *Rhizoctonia medicaginis* DC. On roots of lucerne (*Medicago sativa*), Lincoln. Somewhat rare. P.

168. OZONIUM Lk.

500. *Ozonium auricomum* Lk. Common on decaying wood and old trunks, Lincoln.

501. *Ozonium stuposum* Pers. On decaying planks in old sidewalk, Lincoln. P.

## *Order Sphæropsideæ.*

### 46. SPHÆRIOIDEÆ.

169. PHYLLOSTICTA Pers.

502. *Phyllosticta ampelopsidis* Ell. & Mart. On leaves of Virginia creeper (*Parthenocissus quinquifolia*), Weeping Water. P.

503. *Phyllosticta antennariæ* Ell. & Ev. On everlasting, or ladies' tobacco (*Antennaria plantaginifolia*), Weeping Water. P.

504. *Phyllosticta labruscæ* Thuem. On leaves of wild grape (*Vitis riparia*), Lincoln.

505. *Phyllosticta lycii* Ell. & Kell. On matrimony vine (*Lycium vulgare*), Lincoln. P.

506. *Phyllosticta minutissima* Ell. & Ev. (n. sp. in lit.) On leaves of mountain maple (*Acer glabrum*), Hat Creek basin, Sioux county, August 1, 1889. Spots conspicuous, irregular, roundish, from 5-9 millimetres in diameter, more or less confluent, usually bordered by an irregular yellowish orange band. Very common and apparently quite destructive.

507. *Phyllosticta phaseolina* Sacc. On leaves of wild bean (*Phaseolus diversifolius*), Lincoln. P.

508. *Phyllosticta populina* Sacc. On leaves of cottonwood (*Populus monilifera*), Lincoln. P.

509. *Phyllosticta violæ* Desm. On pansy (*Viola* sp.), Lincoln. P.

170. PHOMA Fr.

510. *Phoma longissima* (Pers.) West. In stems of goose-foot or pig-weed (*Chenopodium album*), Lincoln; atriplex (*Atriplex patula*), Lincoln; amaranth (*Amarantus retroflexus*), Lincoln. Common, forming usually irregular oblong whitish-pallid spots with a black border.

511. *Phoma negundinicola* Thuemen. On stem of box-elder (*Negundo aceroides*), Lincoln; Saltillo. Very common.

512. *Phoma lupini* Ell. & Ev. On lupine (*Lupinus plattensis*), Fort Robinson; Belmont, July 23; Hat Creek basin, Sioux county. Very common and destructive. On the lower surface of the leaf, giving it a more or less blackish velvety appearance.

171. ASTEROMA DC.

513. *Asteroma euphorbiæ* Fuckel. On dead stems of snow-on-the-mountain (*Euphorbia marginata*), Lincoln. Forming irregular dull black or brownish patches.

172. VERMICULARIA Fr.

514. *Vermicularia dematium* (Pers.) Fr. On stems of various weeds, Lincoln. P.

173. SPHÆROPSIS Lev.

515. *Sphæropsis macluræ* Cooke. On stems of Osage orange (*Maclura aurantiaca*), Lincoln. Common, apparently not destructive.

516. *Sphæropsis menispermi* Peck. On dead stems of moon seed (*Menispermum canadensis*), Lincoln.

517. *Sphæropsis smilacis* Ell. & Ev. (Jour. of Myc., Vol. V, p. 149. A new species from Nebraska.) On dead stems of green-brier (*Smilax hispida*), Lincoln, November, 1888. Common. ("Perithecia scattered, buried in the substance of the bark, bursting the cuticle, but only partially erumpent. Sporules oblong, brown, obtuse, 15–20 by 6–8 micromillimetres.")

174. HAPLOSPORELLA Speg.

518. *Haplosporella euonymi* Ell. & Ev. (Jour. of Myc., Vol. V, p. 149. A new species from Nebraska.) On dead stems of burning bush or Washoo (*Euonymous atropurpureus*), Peru, March, 1889. ("Stromata scattered or seriate, erumpent, and loosely surrounded by the ruptured epidermis, hemispherical or oblong, 1–2 millimeters in diameter, subtruncate and finally whitish above. Perithecia entirely inclosed in the stroma with thin subevanescent walls, and appearing on a cross section more like cells than like perithecia; ostiola obscurely papilliform. Sporules oblong, very slightly narrowed in the middle (possibly becoming 1-septate), 10–14 by 6–8 micromillimetres, brown, on slender basidia, 70–80 micromillimetres long. On the smaller twigs the stromata are smaller, but the sporules larger, 18–22 by 10–12 micromillimetres.")

175. DIPLODIA Fr.

519. *Diplodia atrata* (Desm.) Sacc. On stems of box-elder (*Negundo aceroides*), Lincoln.

176. ASCOCHYTA Lib.

520. *Ascochyta smilacis* Ell. & Ev. On leaves of greenbrier (*Smilax hispida*), Lincoln.

177. ACTINONEMA Fries.

521. *Actinonema rosæ* (Lib.) Fr. On leaves of cultivated rose, Lincoln. P.

178. DARLUCA Cast.

522. *Darluca filum* (Biv.) Cast. On *Uredineæ: Æcidium compositarum* var. *lygodesmiæ*, Belmont, July 20; *Uromyces junci*, Broken Bow, July 4; *Puccinia rubigo-vera*, Crete. Common. In some cases apparently quite destructive to the rust.

179. SEPTORIA Fr.

523. *Septoria acerella* Sacc. On leaves of box-elder (*Negundo aceroides*), Lincoln.

524. *Septoria argyræa* Sacc. On silver-berry (*Elæagnus argentea* Pursh), Lincoln. P.

525. *Septoria atriplicis* (West) Fuckel. On goose-foot (*Chenopodium album*), Lincoln.

526. *Septoria atropurpurea* Peck. On aster, Lincoln. P.

527. *Septoria campanulæ* (Lev.) Sacc. On tall bell-flower (*Campanula americana*), Lincoln. P.

528. *Septoria cacaliæ* Ell. & Kell. On tuberous Indian plantain (*Cacalia tuberosa*), Lincoln; pale Indian plantain (*Cacalia atriplicifolia* L.), Nebraska City, June.

529. *Septoria cerasina* Peck. On choke cherry (*Prunus virginiana*), Lincoln.

530. *Septoria cerastii* Rob. & Desm. On mouse-ear chickweed (*Cerastium* sp.), Lincoln. P.

531. *Septoria cirsii* Niessl. On leaves of common thistle (*Cnicus altissimus*), Lincoln. P.

532. *Septoria cornicola* Desm. On dogwood (*Cornus asperifolia*), Lincoln. P.

533. *Septoria conspicua* Ell. & Mart. On loosestrife (*Steironema ciliatum*), Lincoln; Anselmo, July 6.

534. *Septoria cryptotæniæ* Ell. & Rau. On leaves of honewort (*Cryptotænia canadensis*), Lincoln. Very common.

535. *Septoria erigerontis* B. & C., f. *boltoniæ*. On leaves of Boltonia (*Boltonia glastifolia*), Lincoln.

536. *Septoria gaurina* Ell. & Kell. On evening primrose (*Gaura* sp.), Lincoln. P.

537. *Septoria graminum* Desm. On finger grass or crab grass (*Panicum sanguinale*), Lincoln. Rare. P.

538. *Septoria helenii* Ell. & Ev. On sneeze-weed (*Helenium hoopesii*), Weeping Water. P.

539. *Septoria lactucicola* Ell. & Mart. On wild lettuce (*Lactuca floridana*), Lincoln.

540. *Septoria leptostachya* Ell. & Mart. On leaves of lop-seed (*Phryma leptostachya*), Crete. P.

541. *Septoria lophanthi* Wint. On giant hyssop (*Lophanthus nepetoides*), Lincoln. P.

542. *Septoria ludwigiæ* Cooke. On false loosestrife (*Ludwigia polycarpa*), Lincoln.

543. *Septoria mentzeliæ* Ell. & Kell. On *Mentzelia lævicaulis*, Box Butte county.

544. *Septoria mimuli* Ell & Kell. On leaves of monkey flower (*Mimulus ringens*), Lincoln. P.

545. *Septoria nabali* B. & C. On rattlesnake root (*Prenanthes* sp.), Lincoln. P.

546. *Septoria œnotheræ* West. On evening primrose (*Œnothera biennis*), Lincoln.

547. *Septoria pileæ* Thuem. On clear weed (*Pilea pumila*), Lincoln; wood nettle (*Laportea canadensis*), Lincoln.

548. *Septoria polygonorum* Desm. On smart weed (*Polygonum pennsylvanicum*), Lincoln.

549. *Septoria pruni* Ellis. On leaves of plum (*Prunus americana*), Lincoln.

550. *Septoria rudbeckiæ* Ell. & Hals'd. On cone flower (*Rudbeckia laciniata*), Weeping Water. P.

551. *Septoria ribis* Desm. On leaves of gooseberry (*Ribes rotundifolium*), Lincoln. A very common species, sometimes quite destructive.

552. *Septoria rubi* West. On raspberry (*Rubus strigosus*), Lincoln; blackberry (*Rubus* sp.), Lincoln. Not uncommon.

553. *Septoria sambucina* Peck. On leaves of elderberry (*Sambucus canadensis*), Lincoln.

554. *Septoria saniculæ* Ell. & Ev. On leaves of sanicle (*Sanicula canadensis*), Lincoln; sanicle (*Sanicula marilandica*), Weeping Water.

555. *Septoria scrophulariæ* Peck. On leaves of figwort (*Scrophularia nodosa*), Lincoln. Very common, frequently quite destructive.

556. *Septoria scutellariæ* Thuem. On leaves of skull-cap (*Scutellaria lateriflora*), Lincoln. Rare.

557. *Septoria silenicola* Ell. & Mart. On leaves of starry campion (*Silene stellata*), Lincoln. P.

558. *Septoria speculariæ* B. & C. On leaves of Venus' looking-glass (*Specularia perfoliata*), Lincoln; Thedford. Not uncommon.

559. *Septoria symphoricarpi* Ell. & Ev. On leaves of wolf-berry (*Symphoricarpos occidentalis*), Lincoln. P.

560. *Septoria sisymbrii* Ell. On hedge mustard (*Sisymbrium* sp.), Lincoln. P.

561. *Septoria verbenæ* Rob. & Desm. On nettle-leaved vervain (*Verbena urticifolia*), Lincoln. P.

562. *Septoria violæ* West. On leaves of common violet (*Viola palmata* var. *cucullata*), Lincoln. P.

180. CORNULARIA Karst.

563. *Cornularia persicæ* (Schw.) Sacc. On bark of cherry, Weeping Water. (Williams & Pound.)

181. PHLEOSPORA Wallr.

564. *Phleospora anemones* Ell. & Kell. On long-fruited anemone (*Anemone cylindrica*), Weeping Water; Crete. Not uncommon.

### 47. LEPTOSTROMACEÆ.

182. PIGGOTIA B. & Br.

565. *Piggotia fraxini* B. & C. On green ash (*Fraxinus viridis*), Lincoln. Very common. Usually on fallen leaves, but sometimes attacking the fresh ones, forming irregular black patches.

183. LEPTOSTROMA Fr.

566. *Leptostroma hypophylla* B. & Rav. On leaves of honey locust (*Gleditschia triacanthos*), Lincoln. Very common, and apparently quite injurious.

184. DISCOSIA Fr.

567. *Discosia artocreas* (Tode.) Fr. On plane tree (*Platanus occidentalis*), Peru; oak (*Quercus* sp.), Lincoln. Quite common.

### 48. EXCIPULACEÆ.

185. KELLERMANNIA Ell. & Ev.

568. *Kellermania yuccagena* Ell. & Ev. On yucca, or Spanish bayonet (*Yucca augustifolia*), Box Butte county; Anselmo, July 8; Dismal river, Thomas county, July 18; Belmont, July 21. Very common and destructive.

## *Order Melanconieæ.*

### 49. MELANCONIEÆ.

186. GLŒOSPORIUM Desm. & Mont.

569. *Glœosporium acerinum* West. On leaves of silver maple (*Acer dasycarpum*), Lincoln. Common.

570. *Glœosporium ampelophagum* (Pass.) Sacc. On grapes (*Vitis*), Lincoln. P.

571. *Glœosporium lagenarium* (Pass.) Sacc. var. *musarum* Ell. & Ev. (Jour. of Myc., vol. V, p. 155.) On banana rind, Lincoln.

572. *Glœosporium orbiculare* Berk. On squash (*Cucurbita*), very common. Lincoln. November.

573. *Glœosporium rubi* Ell. & Ev. On raspberry (*Rubus* sp.), Lincoln. P.

574. *Glœosporium septorioides* Sacc. On leaves of red oak (*Quercus ruber?*), Weeping Water; bur oak (*Quercus macrocarpa*), Weeping Water, P.; scarlet oak (*Quercus coccinea*), Richardson county, August 25.

575. *Glœosporium stenosporum* Ell. & Kell. On leaves of cottonwood (*Populus monilifera*), Lincoln. P.

187. MELANCONIUM Link.

576. *Melanconium oblongum* Berk. On bark of butternut or white walnut (*Juglans cinerea*), Lincoln. Not common.

188. MARSONIA Fisch.

577. *Marsonia castagnei* (Desm. & Mont.) Sacc. On white poplar (*Populus alba*), Lincoln. Common.

578. *Marsonia martini* Sacc. & Ell. On leaves of bur oak (*Quercus macrocarpa*), Lincoln; Weeping Water.

## *Order Hyphomycetes.*

### 50. MUCEDINEÆ.

189. OOSPORA Wallr.

579. *Oospora albipes* (Peck.) Sacc. On decaying wood, Lincoln. P.

580. *Oospora lactis* (Fres.) Sacc. In water containing coffee, Lincoln. P.

190. MONILIA Pers.

581. *Monilia aureofulva* C. & E. On decaying wood, Lincoln; York.

582. *Monilia fructigena* Pers. On apple peelings, Lincoln. P.

583. *Monilia martinii* Ell. & Sacc. On corn cobs and decaying corn stems, Lincoln. P.

584. *Monilia megalospora* (B. & C.) Sacc. On decaying wood, Brownville.

585. *Monilia mycophila* Sacc. On agarics, Lincoln. P.

191. CYLINDRIUM Bon.

586. *Cylindrium elongatum* Bon. On leaves of oak (*Quercus* sp.), Peru.

192. OIDIUM Link

587. *Oidium erysiphoides* Fr. On leaves of spiderwort (*Tradescantia virginica*), stickseed (*Echinospermum redowskii*), and cuckle-bur (*Xanthium canadensis*), Lincoln. Common.

193. TRICHODERMA Pers.

588. *Trichoderma lignorum* (Tode.) Harz. (*T. virde* Pers.) **On bark of trees,** dead leaves, etc., Lincoln.

194. RHINOTRICHUM Corda.

589. *Rhinotrichum curtisii* Berk. On decaying wood, Lincoln.

590. *Rhinotrichum repens* Preuss. On old trunks, Lincoln. P.

195. SPOROTRICHUM Link.

591. *Sporotrichum elæochroum* Fr. On fruits of rose, Lincoln. P.

592. *Sporotrichum himantiæ* Schw. On corn and grape stems, Lincoln. P.

593. *Sporotrichum roseum* Lk. On bread, Lincoln. P.

594. *Sporotrichum solubile* Schw. On decaying tomato, fallen leaves, etc., Lincoln.

595. *Sporotrichum sulphureum* Grev. On vinegar keg, Lincoln. P.

196. BOTRYTIS Michx.

596. *Botrytis atro-viridis* C. & E. On oak limbs, Lincoln. P.

597. *Botrytis bassiana* Bals. var. *tenella* Sacc. On wasps and beetles in breeding cages, etc.; Lincoln. Common.

598. *Botrytis cinerea* Pers. On decaying fungi, Lincoln. P.

599. *Botrytis cinerella* Sacc. On hickory bark, Lincoln. P.

600. *Botrytis vulgaris* Fr. On fig, Lincoln. P.

197. OVULARIA Sacc.

601. *Ovularia obliqua* (Cke.) Oud. (*Ramularia obovata* Sacc.) **On dock** (*Rumex crispus*), Lincoln. P.

198. SEPEDONIUM Link.

602. *Sepedonium chrysospermum* (Bull.) Fr. On *Polyporus*, Lincoln. P.

603. *Sepedonium flavidum* Sacc. & Ell. On *Trametes*, Lincoln. P.

199. VERTICILLIUM Nees.

604. *Verticillium candidum* Peck. On decaying wood, Lincoln. P.

605. *Verticillium glaucum* Bon. On decaying nuts, Lincoln. P.

606. *Verticillium lateritium* Berk. On bread, Lincoln. P.

200. ACROSTALAGMUS Corda.

607. *Acrostalagmus cinnabarinus* Corda. On decaying banana, Lincoln. P.

201. TRICOTHECIUM Link.

608. *Trichothecium roseum* Pers. On various decaying substances, Lincoln.

202. DIDYMARIA Corda.

609. *Didymaria astragali* (Ell. & Hol.) Sacc. (*Ramularia astragali* Ell. & Hol.) On wild pea (*Astragalus canadensis*), Lincoln.

203. DACTYLIUM Nees.

610. *Dactylium dendroides* (Bull.) Fr. On corn and decaying fungi, Lincoln. P.

204. RAMULARIA Ung.

611. *Ramularia apiculata* Ell. & Ev. (n. sp. in lit.) Forming white mealy patches on leaves of common violet (*Viola palmata* var. *cucullata*), Lincoln. P.

612. *Ramularia armoraciæ* Fuckel. On horse-radish (*Nasturtium armoracia*), Lincoln. P.

613. *Ramularia arvensis* Sacc. On cinque-foil (*Potentilla norvegica*), Lincoln. P.

614. *Ramularia celastri* Ell. & Mart. On bitter-sweet (*Celastrus scandens*), Lincoln.

615. *Ramularia celtidis* Ell. & Kell. On hackberry (*Celtis occidentalis*), Lincoln. P.

616. *Ramularia dicipiens* Ell. & Ev. On dock (*Rumex crispus*), Lincoln. Common.

617. *Ramularia grindeliæ* Ell. & Kell. On fetid gum plant (*Grindelia squarrosa*), Lincoln. P.

618. *Ramulari mimuli* Ell. & Kell. On monkey-flower (*Mimulus ringens*), Lincoln. P.

619. *Ramularia plantaginis* Ell. & Mart. On plantain (*Plantago major*), Lincoln.

620. *Ramularia tulasnei* Sacc. On leaves of strawberry (*Fragaria virginiana* var. *illinoensis*), Lincoln; wild strawberry (*Fragaria vesca*), Anselmo, July 6.

621. *Ramularia urticæ* Ces. On leaves of nettle (*Urtica gracilis*), Lincoln. P.

622. *Ramularia virgaureæ* Thuem. On leaves of golden-rod (*Solidago rigida* and *S. nemoralis*), Lincoln. P.

205. PERICULARIA Sacc.

623. *Pericularia grisea* (Cke.) Sacc. On leaves of finger grass (*Panicum sanguinale*), Lincoln; Muhlenberg grass (*Muhlenbergia racemosa*), Lincoln (P.); rice cut-grass (*Leersia virginica*), Lincoln; panic grass (*Panicum dichotomum*), Lincoln (P.); yellow fox-tail (*Setaria glauca*), Lincoln (P.); millet (*Setaria italica*), Lincoln (P.).

206. CERCOSPORELLA Sacc.

624. *Cercosporella chionea* (Ell. & Kell.) Sacc. (*Cercospora chionea* Ell. & Kell.) On red-bud (*Cercis canadensis*), Lincoln; Richardson county. Very common and destructive, forming large, irregular, brownish patches, with an orange colored border.

207. SEPTOCYLINDRIUM Bon.

625. *Septocylindrium bonordenii* Sacc. (*Cylindrium septatum* Bon.), Lincoln. P.

## 51. DEMATIEÆ.

208. TORULA Pers.

626. *Torula herbarum* Link. On stems of pumpkin, Lincoln. P.

209. STREPTOTHRIX Corda.

627. *Streptothrix atra* B. & C. On oak bark, Saltillo. P.

210. ZYGODESMUS Corda.

628. *Zygodesmus pannosus* B. & C. On decaying wood, Lincoln. P.

211. ACREMONIELLA Sacc.

629. *Acremoniella atra* (Corda) Sacc. On decaying stems of grass. Rare. Lincoln. P.

212. ELLISIELLA Sacc.

630. *Ellisiella caudata* (Peck.) Sacc. On stems of bushy blue stem *Andropogon nutans*), Lincoln. P.

213. MYXOTRICHUM Kunze.

631. *Myxotrichum deflexum* Berk. On nut shell, Lincoln. P.

214. FUSICLADIUM Bonord.

632. *Fusicladium dendriticum* (Wallr.) Fuckel. Apple speck. On leaves and fruit of apple (*Pyrus malus*), Lincoln. Very common. It is the little black speck of the apple rind.

215. SCOLECOTRICHUM Kunze & Schm.

633. *Scholecotrichum maculicola* Ell. & Kell. On leaves of reed grass (*Phragmites communis*), Howard county.

216. POLYTHRINCIUM Kunze & Schm.

634. *Polythrincium trifolii* Kunze. On white clover (*Trifolium repens*), Lincoln. P.

217. CLADOSPORIUM Link.

635. *Cladosporium epimyces* Cke. On *Agaricus*, Lincoln.

636. *Cladosporium graminum* Corda. On decaying grass, Lincoln. P.

637. *Cladosporium herbarum* (Pers.) Link. On various decaying stems, leaves, etc., Lincoln; Peru; Nebraska City.

638. *Cladosporium papyricolum* B. & Br. On paste board, Lincoln.

639. *Cladosporium triostei* Peck. On horse gentian (*Triosteum perfoliatum* L.), Lincoln. P.

218. CLASTEROSPORIUM Schw.

640. *Clasterosporium macluræ* (Thuemen) Pound. (*Sporodesmium macluræ* Thuem., Myc. Univ. 2074.) On leaves of Osage orange (*Maclura aurantiaca*), Lincoln. Not common. ("Seems to have been omitted by Saccardo. I think it is a *Clasterosporium*. Thuemen says, '*Sporodesmium scirpiola* valde proximum.' Saccardo places the latter in *Clasterosporium*." Pound.)

219. HELMINTHOSPORIUM Link.

641. *Helminthosporium macrocarpum* Grev. On ash limbs, Lincoln. P.

642. *Helminthosporium septemseptatum* Peck. On decaying grass and wood, Lincoln. P.

220. CERCOSPORA Fries.

643. *Cercospora acalyphæ* Peck. On three-seeded mercury (*Acalypha virginica*), Lincoln.

644. *Cercospora acetosellæ* Ell. On field or sheep-sorrel (*Rumex acetosella*), Lincoln. P.

645. *Cercospora alismatis* Ell. & Holw. On water plantain (*Alisma plantago*), Weeping Water. P.

646. *Cercospora ampelopsidis* Peck. On Virginia creeper (*Parthenocissus quinquefolia*), Lincoln. P.

647. *Cercospora avicularis* Wint. On knotweed or knotgrass (*Polygonum erectum*), Lincoln. P.

648. *Cercospora beticola* Sacc. On leaves of beet, Lincoln. P.

649. *Cercospora brachiata* Ell. & Ev. On amaranth or pig-weed (*Amarantus retroflexus*), Lincoln. P.

650. *Cercospora catalpæ* Wint. On leaves of *Catalpa*, Lincoln. P.

651. *Cercospora ceanothi* Kell. & Sw. On red-root or shoe string (*Ceanothus ovatus*), Weeping Water. P.

652. *Cercospora circumscissa* Sacc. On leaves of cherry (*Prunus virginiana*), Lincoln. P.

653. *Cercospora clavata* (Ger.) Peck. On common milkweed (*Asclepias syriaca*), Lincoln.

654. *Cercospora depazeoides* (Desm.) Sacc. On leaves of common elderberry (*Sambucus canadensis*), Lincoln. P.

655. *Cercospora desmanthi* Ell. & Kell. On desmanthus (*Desmanthus brachylobus*), Lincoln. P.

656. *Cercospora diospyri* Thuem. On leaves of persimmon (*Diospyros virginiana*), Lincoln.

657. ***Cercospora euonymi*** **Ell. On leaves of burning bush or Waahoo (*Euonymus americanus*), Weeping Water. P.**

658. *Cercospora eupatorii* Peck. On white snakeroot (*Eupatorium ageratoides*), Lincoln. P.

659. *Cercospora ferruginea* Fuckel. On great ragweed (*Ambrosia trifida*), Lincoln. Common.

660. *Cercospora galii* Ell. & Holw. On wild liquorice or bedstraw (*Galium circæzans*), Lincoln. P.

661. *Cercospora glandulosa* Ell. & Kell. On tree of heaven (*Ailanthus glandulosus*), Lincoln. P.

662. *Cercospora gossypina* Cke. On leaves of cotton cultivated near Lincoln.

663. *Cercospora granuliformis* Ell. & Holw. On common blue violet (*Viola palmata* var. *cucullata*), Lincoln.

664. *Cercospora hydropiperis* (Thuem) Speg. On smartweed (*Polygonum pennsylvanicum*), Lincoln. P.

665. *Cercospora isanthi* Ell. & Kell. On false pennyroyal (*Isanthus cæruleus*), Cass county.

666. *Cercospora lini* Ell. & Ev. On wild flax (*Linum sulcatum*), Lincoln. P.

667. *Cercospora liriodendri* Ell. & Harkn. On tulip tree (*Liriodendron tulipifera*), Lincoln. P.

668. *Cercospora microsora* Sacc. On leaves of basswood (*Tilia* sp.), Lincoln. P.

669. *Cercospora monoica* Ell. & Holw. On leaves of hog peanut or ground nut (*Amphicarpæa monoica*), Crete.

670. *Cercospora murina* Ell. & Kell. On blue violet (*Viola palmata* var. *cucullata*), Lincoln; yellow violet (*Viola pubescens*), Lincoln. P.

671. *Cercospora negundinis* Ell. & Ev. (n. sp. in lit.) On leaves of box-elder (*Negundo aceroides*), Lincoln. P.

672. *Cercospora oxybaphi* Ell. & Halst. On *Oxybaphus nyctagineus*, Lincoln. P.

673. *Cercospora passaloroides* Wint. On lead plant (*Amorpha canescens*), Lincoln.

674. *Cercospora pentstemonis* Ell. & Kell. On pentstemon (*Pentstemon grandiflorus* and *P. glaber*), Lincoln.

675. *Cercospora physalidis* Ell. On ground cherry (*Physalis lanceolata*), Lincoln. P.

676. *Cercospora physalidis* Ell. var. *concentrica* Ell. & Ev. (n. var. N. A. F. 2299.) On ground cherry (*Physalis lanceolata*), Lincoln.

677. *Cercospora plantagnis* Sacc. On common plantain (*Plantago major*), Lincoln. P.

678. *Cercospora pulvinulata* Sacc. & Wint. On mulberry (*Morus* sp.), Lincoln. P.

679. *Cercospora rhamni* Fuckel. On buckthorn (*Rhamnus lanceolatus*), Weeping Water. P.

680. *Cercospora rhoina* Cke. & Ell. On sumach (*Rhus glabra*), Lincoln (P.); dwarf sumach (*Rhus copallina*), Richardson county, August.

681. *Cercospora rosicola* Pass. On rose (*Rosa arkansana*), Lincoln.

682. *Cercospora rubi* Sacc. On raspberry (*Rubus* sp.), Lincoln. P.

683. *Cercospora scutellariæ* Ell. & Ev. On skull cap (*Scutellaria parvula*), Lincoln. P.

684. *Cercospora sedoides* Ell. & Ev. On ditch stone crop (*Penthorum sedoides*), Lincoln. P.

685. *Cercospora seminalis* Ell. & Ev. On ovaries of buffalo grass (*Buchloe dactyloides*), Indianola. (Dr. Bessey.)

686. *Cercospora silphii* Ell. & Ev. On rosin weed (*Silphium integrifolium*), Lincoln. P.

687. *Cercospora smilacina* Sacc. On leaves of greenbrier (*Smilax hispida*), Lincoln. P. Very common.

688. *Cercospora sorghi* Ell. & Ev. On Johnson grass (*Andropogon sorghum* var. *halepensis*), Hitchcock and Furnas counties.

689. *Cercospora squalidula* Peck. On leaves of clematis (*Clematis ligusticifolia*), Belmont, Dawes county, July 18. Very common.

690. *Cercospora teucrii* Ell. & Kell. On germander (*Teucrium canadensis*), Lincoln.

691. *Cercospora venturioides* Peck. On milkweed (*Asclepias syriaca*), Lincoln. P.

692. *Cercospora violæ* Sacc. On blue violet (*Viola palmata* var. *cucullata*), Lincoln.

693. *Cercospora viticola* Sacc. On cultivated grape (*Vitis* sp.), Lincoln. P.

221. HETEROSPORIUM Klotzsch.

694. *Heterosporium fungicolum* Ell. & Ev., Jour. of Myc., V, p. 10. On *Polyporus* and *Agaricus*, Lincoln. P.

222. NAPICLADIUM Thuem.

695. *Napicladium arundinaceum* (Corda) Sacc. Forming a black powder on the lower surface of the leaves of reed grass (*Phragmites communis*), Thedford, Thomas county, July 11, 1889.

223. DENDRYPHIUM Wallr.

696. *Dendryphium crustaceum* Ell. & Ev. (n. sp. in lit.) On decaying wood, Milford, October, 1888, with *Sphæria incrustans* E. & E. (n. sp. in lit.) (Hyphæ slightly branched, septate, nodulose, fuscous, 35–140 by 6–12 micromillimetres; conidia darker than the hyphæ, oblong, 3–5 septate, thick walled, 48–60 by 10–16 micromillimetres.)

224. CONIOTHECIUM Corda.

697. *Coniothecium toruloides* Corda. On bark of willow (*Salix* sp.), Brownville.

225. MACROSPORIUM Fr.

698. *Macrosporium chartarum* Peck. On paste-board, Lincoln. P.

699. *Macrosporium cladosporioides* Desm. On carpet paper. Lincoln.

700. *Macrosporium commune* Rabh. On decaying leaves and stems, Lincoln. Very common.

701. *Macrosporium compactum* Cke. On castor-oil plant (*Ricinus* sp.), Lincoln (P.). Apparently the same on gentian, Lincoln.

702. *Macrosporium hibiscinum* Thuem. On dead stems of rose mallow (*Hibiscus esculentus*), Lincoln. P.

703. *Macrosporium pinguedinis* Berk. On decaying grass, Lincoln.

704. *Macrosporium solani* E. & M. On leaves of Stramonium (*Datura stramonium*), Richardson county, August 26. Very common. On under surface of eroded brownish spots that have a more or less concentric banded appearance.

705. *Macrosporium sarcinula* Berk. On fruit of wild pumpkin (*Cucurbita fœtidissima*), Lincoln. P. (Specimen brought from western Nebraska.)

706. *Macrosporium tomato* Cke. var. *cucurbitæ* Ell. & Ev. (n. var. in lit.) On gourd, Lincoln, November, 1889. Forming conspicuous black powdery spots.

### 52. STILBEÆ.

226. STILBUM Tode.

707. *Stilbum vulgare* Tode. On decaying wood, Lincoln. P.

227. CERATIUM Alb. & Schw.

708. *Ceratium hydnoides* (Jacq.) Alb. & Schw. On decaying wood, Belmont, Dawes county, July. ["Considered by DeBary and Schroeter to be a Myxomycete." B.]

228. PODOSPORIUM Schw.

709. *Podosporium rigidum* Schw. On ground cherry (*Physalis* sp.) and grape stems, Lincoln.

229. ISARIOPSIS Fr.

710. *Isariopsis clavispora* (B. & C.) Sacc. On cultivated grapes (*Vitis*), Lincoln. P.

### 53. TUBERCULARIEÆ.

230. TUBERCULARIA Tode.

711. *Tubercularia vulgaris* Tode. On dead limbs, Lincoln. P.

231. DENDRODOCHIUM Bon.

712. *Dendrodochium macrosporum* Sacc. & Ell. var. *aphanistophus* Ell. & Ev. On dead stems of weed, probably *Helianthus*, Lincoln. Spores 4-5 by 12-15 micromillimetres.

232. TUBERCULINA Sacc.

713. *Tuberculina persicina* (Ditm.) Sacc. In cups of the rust *Æcidium compositarum* var. *lygodesmæ*, Belmont, Dawes county, July 20. Very destructive, its smooth violet colored spores filling up fully half of the pseudo-peridia and injuring many more, destroying and taking the place of the æcidiospores.

233. ILLOSPORIUM Mart.

714. *Illosporium roseum* (Schreb.) Mart. On lichen (*Physcia stellaris*), Lincoln; Belmont.

234. FUSARIUM Link.

715. *Fusarium graminium* Corda. On corn stems, Lincoln. Apparently the same on buffalo grass (*Buchloe dactyloides*), Lincoln. P.

716. *Fusarium incarnatum* (Desm.) Sacc. On germinating barley in laboratory, Lincoln. P.

717. *Fusarium lateritium* Nees. On decaying wood, Lincoln.

718. *Fusarium oxysporium* Schlecht. f. *aurantiacum* Corda. On squash, Lincoln.

719. *Fusarium roseum* Link. On rose mallow (*Hibiscus triorum*); milkweed (*Asclepias syriaca*); pigweed (*Amarantus retroflexus*); corn (*Zea mays*), and various grasses, Lincoln.

## CLASS IV.—BASIDIOMYCETES.

### *Order Gasteromycetes. The Puff-balls.*

### 54. PHALLOIDEÆ. STINK-HORN FUNGI.

235. DICTYOPHORA Desvaux.

720. *Dictyophora duplicata* (Bosc.) Ed. Fisch. On ground. Rare. One specimen preserved in alcohol in University herbarium.

236. ITHYPHALLUS Fries.

721. *Ithyphallus impudicus* (L.) Fries. Common stink-horn fungus. On ground, Lincoln. Common.

722. *Ithyphallus impudicus* (L.) Fries. var. *imperialis* (Schulz) Ed. Fisch. With

reddish or pinkish volva. On ground in grass, Lincoln; Beatrice. Common.

237. MUTINUS Fries.

723. *Mutinus caninus* (Huds.) Fries. On ground in sand hills, Broken Bow, July 4. A specimen sent from Valentine by Rev. Bates I consider to be this species also.

238. SIMBLUM Klotzsch.

724. *Simblum rubescens* Gerard. Quite common in grass and open weedy places. I collected twenty-five specimens at one time on open stubble ground. The abnormal, two-stemmed form I have found several times. Lincoln.

### 55. NIDULARIACEÆ.

239. CYATHUS Hall.

725. *Cyathus vernicosus* (Bull.) DC. On old decaying logs, etc., Lincoln.

240. CRUCIBULUM Tul.

726. *Crucibulum vulgare* Tul. On decaying wood, common, Lincoln; Weeping Water.

241. SPHÆROBOLUS Tode.

727. *Sphærobolus stellatus* Tode. On pine sidewalk, Lincoln.

### 56. LYCOPERDIACEÆ.

242. SECOTIUM Kunze.

728. *Secotium warnei* Peck. On ground, very common, Lincoln; Dismal river, Thomas county, July 12. Two forms occur quite commonly: (*a*), columnar umbonate; (*b*), depressed globose.

243. TYLOSTOMA Pers. Stalked puff-balls.

729. *Tylostoma fimbriatum* Fr. On ground, quite common, Lincoln.

730. *Tylostoma mammosum* (Mich.) Fr. On ground. Not common. Lincoln; Belmont, July 25. My specimens from Lincoln are considerably larger than the type. They have the definite mouth of *T. mammosum*, but the peridium is depressed globose in shape.

731. *Tylostoma meyenianum* Kl. In grass on prairies, sandy soil. Dismal river, Thomas county, July 12; Belmont, Dawes county, July 21.

731½. *Tylostoma campestre* Morg. In grass with *T. fimbriatum* Fr. Lincoln.

244. GEASTER Mich. Earth stars.

732. *Geaster campester* Morg. In grass, weeds, and barren spots, very common. Lincoln.

733. *Geaster delicatus* Morg. In grass and in open, barren, clayey soil destitute of weeds. Lincoln.

733½. *Geaster limbatus* Fr. At base of stumps, Lincoln, April 26, 1890. (Presented by Mr. Shimek, of the State University.)

734. *Geaster vittatus* Kalchbr. On ground, Waverly.

245. BOVISTA Dill.

735. *Bovista circumscissa* Berk. & Curt. On ground in grass, very common. Lincoln; Dismal river, Thomas county; Belmont, Dawes county.

736. *Bovista minor* Morgan (n. sp. in lit.) On ground in woods, rare. Lincoln. A small species, inner peridium papyraceus, black or darkish brown, shiny.

246. LYCOPERDON Tourn. Puff-balls.

737. *Lycoperdon atro-purpureum* Vitt. On ground in grass, Lincoln.

738. *Lycoperdon atro-purpureum* Vitt. var. *stellare* Peck. On ground, Lincoln.

739. *Lycoperdon bovista* L. (*L. giganteum* Batsch.) On ground, common. Lincoln; Greenwood.

740. *Lycoperdon cyathiforme* Bosc. On ground in pastures and yards, Lincoln.

741. *Lycoperdon fragile* Vitt. In grass on prairies, quite common in the western part of the state. Lincoln; Belmont, Dawes county, July 25; Dismal river, Sioux county, August 2.

742. *Lycoperdon frostii* Peck. On ground in woods, rare. Weeping Water. A beautiful species with long spines.

743. *Lycoperdon gemmatum* Batsch. On rotting wood, common. Waverly; Lincoln; Wymore; Peru.

744. *Lycoperdon lepidophorum* Ell. & Ev. On ground, Lincoln. Rare. I have found but one specimen and that rather old, but Morgan thinks it this species.

745. *Lycoperdon piriforme* Schæff. On ground near stumps, etc., common. Lincoln; Milford; Peru.

746. *Lycoperdon wrightii* Berk. & Curt. On ground, common. Lincoln; Peru; Thedford.

247. SCLERODERMA Pers.

747. *Scleroderma corium* (Guers.) Grav. (*Mycenastrum corium* Desv.) On ground, common. Lincoln.

748. *Scleroderma olivaceum* Cke. & Massee. In grass, Lincon.

## *Order Hymenomycetes.*

### 57. AGARICINEÆ. TOADSTOOLS.

248. LEPIOTA Fr.

749. *Lepiota procera* Scop. On ground, rare. Lincoln.

749½. *Lepiota morgani* Peck. In grass, rare. Lincoln.

249. TRICHOLOMA Fr.

750. *Tricholoma flavidum* Peck. On ground, Lincoln.

751. *Tricholoma cerinum* Pers. At base of old stumps, Lincoln.

752. *Tricholoma spermaticum* Fr. On tree trunks, etc., Lincoln.

753. *Tricholoma sulphureum.* On ground, Lincoln.

250. PLEUROTUS Fr.

754. *Pleurotus sapidus* Kalchbr. On ground, Lincoln. Bessey.

755. *Pleurotus ostreatus* Jacq. On old decaying logs, railroad ties, etc., Lincoln.

251. LENTINUS Fr.

756. *Lentinus sulcatus* Berk. On trunks of trees, rare. Milford.

757. *Lentinus tigrinus* (Bull.) Fr. On old logs, etc., common. Lincoln.

252. PANUS Fr.

758. *Panus conchatus* Fr. On decaying wood, Lincoln; Weeping Water.

759. *Panus farinaceus* Schum. On old logs, rare. Lincoln.

760. *Panus stipticus* (Bull.) Fr. On old wood, etc., Lincoln; Peru. Quite common.

253. LENZITES Fr.

761. *Lenzites betulina* (L.) Fr. On decaying limbs, common. Lincoln; Peru.

762. *Lenzites separia* Fr. On old logs, common. Lincoln

763. *Lenzites vialis* Peck. On old logs, etc., rare. Peru.

254. SCHIZOPHYLLUM Fr.

764. *Schizophyllum commune* Fr. On bark of trees, very common. Lincoln; Peru; Omaha; Nebraska City; Weeping Water.

255. PHOLIOTA Fr.

765. *Pholiota dura* Bolton. On ground, rare. Wymore.

256. INOCYBE Fr.

766. *Inocybe flocculosa* Berk. In grass on ground, Lincoln.

257. PAXILLUS Fr.

767. *Paxillus porosus* Berk. On ground in deep woods, not uncommon, Lincoln.

258. AGARICUS L.

768. *Agaricus campester* L. Edible mushroom. On ground, very common, Lincoln.

769. *Agaricus pratensis* Schæff. On ground, rare, Ashland. U.

259. HYPHOLOMA Fr.

770. *Hypholoma hydrophilum* Bull. On ground Lincoln.

260. PSILOCYBE Fr.

771. *Psilocybe spadicea* Fr. On ground, Weeping Water.

261. COPRINUS Pers. Ink toadstool.

772. *Coprinus micaceus* (Bull.) Fr. On ground, Lincoln.

773. *Coprinus radiatus* (Bolt.) Fr. In flower pot in laboratory, Lincoln.

774. *Coprinus variegatus* Peck. On ground, Lincoln.

262. PANÆOLUS Fr.

775. *Panæolus solidipes* Peck. On ground, Lincoln.

### 58. POLYPOREÆ. BRACKET FUNGI.

263. GYRODON Opatowski.

776. *Gyrodon sistotrema* Fr. (*Boletus sistotrema* Fr.) On ground, rare, Lincoln.

264. POLYPORUS Michx.

777. *Polyporus adustus* (Willd.) Fr. On old decaying wood, logs, etc., Lincoln; Peru; Weeping Water.

778. *Polyporus arcularius* (Batsch.) Fr. On ground, common, Lincoln; Hastings; Nebraska City.

779. *Polyporus crispus* (Pers.) Fr. On decaying wood, Lincoln.

780. *Polyporus elegans* (Bull.) Fr. var. *numularius* Fr. On decaying logs, Lincoln.

781. *Polyporus fumosus* (Pers.) Fr. On old trees, Lincoln.

782. *Polyporus gilvus* Schw. On decaying logs, very common, Lincoln; Wymore; Peru; Omaha; Weeping Water; Nebraska City; Dismal river, Thomas county; Belmont, Dawes county.

783. *Polyporus lacteus* Fr. On old logs, Plattsmouth; Lincoln.

784. *Polyporus picipes* Fr. On ground and decaying logs, common, Lincoln; Belmont, Dawes county, July 18.

785. *Polyporus resinosus* (Schrad.) Fr. On old trees, Brownville.

786. *Polyporus sulphureus* (Bull.) Fr. On decaying wood, Lincoln.

265. FOMES Fr.

787. *Fomes applanatus* (Pers.) Wallr. On decaying wood, Lincoln.

788. *Fomes fomentarius* (L.) Fr. On old logs, Lincoln.

789. *Fomes fraxinophilus* Pk. On old logs. Common in the western part of the state. Dismal river, Thomas county, July 13; Anselmo, July 6.

790. *Fomes ignarius* (L.) Fr. On bark of trees, Lincoln.

791. *Fomes pinicola* Fr. On pine logs. Not uncommon in the northwestern part of the state. Belmont, July 25, 1889. Above brownish, waxy, especially on new growth.

792. *Fomes salicinus* (Pers.) Fr. On decaying trees, Lincoln.

793. *Fomes volvatus* Peck. On decaying trunks of pine. Rare in Nebraska. Belmont, July 24. A very beautiful species.

266. POLYSTICTUS Fr.

794. *Polystictus abietinus* Fr. On decaying pine logs. Rare. Belmont, July 22.

795. *Polystictus conchifer* Schw. On old logs, common. Lincoln.

796. *Polysticus hirsutus* Fr. On old logs, tree trunks, etc., Lincoln; Belmont; Peru; Weeping Water; Anselmo.

797. *Polystictus laceratus* Berk. On decaying trunks and limbs, York; Lincoln.

798. *Polystictus sanguineus* (L.) Mey. On trunks of trees, Milford; Nebraska City; Lincoln; Richardson county; Plattsmouth. A beautiful scarlet-red species. Quite common.

799. *Polystictus versicolor* (L.) Fr. On old stumps. Our most common species. Lincoln; Wymore; Weeping Water; Peru; Omaha; Tecumseh; Anselmo; Thedford; Belmont.

267. PORIA Pers.

800. *Poria obducens* Pers. On decaying wood, Lincoln.

268. TRAMETES Fr.

801. *Trametes peckii* Kalchbr. On old limbs and trunks of various kinds, especially cottonwood and willow, common. Lincoln.

269. DÆDALEA Pers.

802. *Dædalea confragosa* Pers. On decaying wood and bark of trees, common. Peru; Lincoln; Milford.

803. *Dædalea quercina* (L.) Pers. On old red cedar logs, Dismal river, Thomas county, July 13; Anselmo, Custer county, July 6.

804. *Dædalea unicolor* (Bull.) Fr.

270. MYRIADOPORUS Peck.

805. *Myriadoporus adustus* Peck. On decaying wood, Milford; Plattsmouth.

271. FAVOLUS Fr.

806. *Favolus europæus* Fr. On bark of trees, Lincoln; Peru.

272. GLŒOPORUS Mont.

807. *Glœoporus conchoides* Mont. On dead limbs, etc., common. Peru.

273. MERULIUS Hall.

808. *Merulius ambiguus* Berk (*M. fugax* Rav.) On bark of decaying pine logs, common. Belmont, July 25. All of my Nebraska specimens seem to grow from old worm holes in the wood, which in mature specimens is near the centre of the more or less circular hymenium, remaining as a small peculiar appearing central hole. I notice that

this is true also of the specimens distributed by Ellis & Everhart (N. A. F. No. 925).

809. *Merulius lachrymans* (Jacq.) Fr. On rotten wood in shaded places, cellars, etc., common. Lincoln.

810. *Merulius tremellosus* Schrad. On ground under old floor, Lincoln.

274. SOLENIA Hoffm.

811. *Solenia ochracea* Hoffm. On stems of Waahoo or Burning Bush (*Euonymus atropurpureus*), Peru.

### 59. HYDNEÆ.

275. HYDNUM L.

812. *Hydnum coralloides* Scop. On rotten wood, rare. Lincoln.

813. *Hydnum ochraceum* Pers. On old stumps, common. Lincoln.

276. IRPEX Fr.

814. *Irpex sinuosus* Fr. On dead limbs, Lincoln; Milford.

277. GRANDINIA Fr.

815. *Grandinia crustosa* (Pers.) Fr. On decaying wood, Lincoln.

816. *Grandinia hydnoides* Ell. & Ev. (n. sp. in lit.) On bark of box-elder (*Negundo aceroides*), Lincoln.

### 60. THELEPHOREÆ.

278. THELEPHORA Ehr.

817. *Thelephora willeyi* Clinton. On ground in woods, Lincoln.

279. STEREUM Pers.

818. *Stereum curtisii* Berk. On bark of limbs, Peru.

819. *Stereum frustulosum* (Pers.) Fr. On decaying logs, common. Lincoln; Milford.

820. *Stereum hirsutum* (Willd.) Fr. On old stump, Plattsmouth.

821. *Stereum ochroleucum* Fr. On bark of living trees, Milford; Peru; Lincoln.

822. *Stereum versicolor* (Schw.) Fr. On decaying wood, Peru; Weeping Water; Lincoln.

280. HYMENOCHÆTE Lev.

823. *Hymenochæte cervina* Berk. & Curt. On old wood, Lincoln.

824. *Hymenochæte corrugata* (Fr.) Lev. On decaying limbs, Lincoln.

825. *Hymenochæte rubiginosa* (Schr.) Lev. On old stumps, Milford; Lincoln.

281. CORTICIUM Fr.

826. *Corticium incarnatum* (Pers.) Fr. On decaying wood, Lincoln.

827. *Corticium leve ?* Pers. On bark of oak, Peru.

282. PENIOPHORA Cke.

828. *Peniophora occidentalis* Ell. & Ev. On decaying branches, Brownville.

283. CYPHELLA Fr.

829. *Cyphella pezizoides* Zopf. (*Peziza campanula* Ellis, in Torr. Bull., vol. VIII, p. 73.) On stems of basswood (*Tilia americana*), Peru.

### 61. CLAVARIEÆ.

284. CLAVARIA Vaill.

830. *Clavaria crispula* Fr. On decaying wood, Lincoln.

### 62. TREMELLINEÆ.

285. HIRNEOLA Fr.

831. *Hirneola auricula-judæ* (L.) Berk. On bark of living trees, especially

bur oak, Weeping Water; Lincoln; Peru; Nebraska City. A common and conspicuous species.

286. TREMELLA Dill.

832. *Tremella frondosa* Fr. On decaying wood, common. Lincoln ; Peru.

## CLASS V.—CHARACEÆ. THE STONEWORTS.

### 63. CHAREÆ.

287. CHARA (Vaill.) Leonh.

833. *Chara coronata* A. Br. Very common in the ponds of central and western Nebraska. Thedford, July 10; Belmont; Ft. Robinson, July 29.

834. *Chara* sp. In ponds usually with the preceding. Thedford; Belmont.

### 63½. NITELLEÆ.

287½. NITELLA Ag.

834½. *Nitella opaca* Ag. In small, stagnant pond, Lincoln, May 5, 1890. A medium sized diœcious species found in considerable quantity by Mr. Shimek, of the State University.

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# BRYOPHYTA.

## CLASS I.—HEPATICÆ.

### 64. RICCIACEÆ.

288. RICCIA Mich.

835. *Riccia fluitans* L. Common in rather stagnant ponds. Fremont; Thedford, Thomas county, July 11.

836. *Riccia glauca* L. On ground, Lincoln.

837. *Riccia lescuriana ?* Aust. High field, Lincoln. (Smith.)

### 65. MARCHANTIACEÆ.

289. MARCHANTIA L.

838. *Marchantia polymorpha* L. On ground, common. Lincoln; Dismal river, Thomas county, July 13; Belmont, July 24.

290. PREISSIA Nees.

839. *Preissia hemisphærica* (L.) Cogn. (*P. commutata* Nees.) On ground, Plattsmouth.

291. GRIMALDIA Raddi.

840. *Grimaldia barbifrons* Bisch. Damp places on ground, Waverly.

292. ASTERELLA Beauv.

841. *Asterella hemisphærica* Beauv. On ground, South Bend, September.

293. CONOCEPHALUS Neck.

842. *Conocephalus conicus* (L.) Dumort. Damp shaded banks, forming large mats, common. Dismal river, Thomas county, July 13.

294. FIMBRIARIA Nees.

843. *Fimbriaria tenella* Nees. On ground, South Bend, September.

### 66. ANTHOCEROTACEÆ.

295. ANTHOCEROS L.

844. *Anthoceros punctatus* L. On ground, South Bend, September.

### 67. JUNGERMANIACEÆ.

296. FRULLANIA Raddi.
    845. *Frullania eboricensis* Gottsche. On trees, Plattsmouth. (Bessey.)

297. MADOTHECA Dumort.
    846. *Madotheca platyphylla* (L.) Dumort. (*Porella platyphylla* Lind.) On ground, Weeping Water.

298. LOPHOCOLEA Nees.
    847. *Lophocolea heterophylla* (Schrad.) Nees. On old logs, Belmont, July 21; South Bend, September.

299. PALLAVICINIA S. F. Gray.
    848. *Pallavicinia hibernica* (Hook.) S. F. Gray. On ground, Belmont, July 25; Dismal river, Thomas county, July 13, 1889. (Dr. Underwood says: "I cannot distinguish this from *Pallavicinia hibernica.* It has also been sent by Prof. Macoun, from northwestern America. It is new to the country.")
    849. *Pallavicinia lyellii* (Lehm.) S. F. Gray. On ground in canons, Belmont, July 21; Dismal river, Thomas county, July 13.

## CLASS II.—MUSCI.

### 68. BRYACEÆ.

300. CERATODON Brid.
    850. *Ceratodon purpureus* (L.) Brid. On ground, Lincoln.

301. DIDYMODON Hedw.
    851. *Didymodon cylindricus* Bruch & Schimp. On ground, Belmont, Dawes county, July 24. Nicely in fruit. (Described as rarely fertile.)

302. BARBULA Hedwig.
    852. *Barbula unguiculata* Hedw. On rocks, Brownville, January 2.

303. COSCINODON Sprengel.
    853. *Coscinodon wrightii* Sulliv. On rocks, etc.; common in western part of the state. Culbertson; Belmont; Sioux county.

304. ORTHOTRICHUM Hedw.
    854. *Orthotrichum strangulatum* Beauv. On trees and rocks, Weeping Water; Lincoln; Sioux county. Very common.

305. PHYSCOMITRIUM Brid.
    855. *Physcomitrium acuminatum* Bruch & Schimp. On low, wet ground, common. Lincoln, May.
    856. *Physcomitrium pyriforme* (Hedw.) Brid. On ground, etc., Lincoln; Nebraska City.

306. FUNARIA Schreb.
    857. *Funaria hygrometrica* (L.) Sibth. On ground, Lincoln, April and May; Plattsmouth.
    858. *Funaria hygrometrica* (L.) Sibth. var. *patula* Bruch & Schimp. On ground, common. Thedford, July 14; Belmont, July 24.

307. LEPTOBRYUM Schimp.
    859. *Leptobryum pyriforme* (L.) Schimp. On wet banks, Belmont, July 24.

308. WEBERA Hedw.
    860. *Webera acuminata* (Hoppe. & Hornsch.) Schimp. On ground, Thedford, August 1.

861. *Webera nutans* (Schreb.) Hedw. On decaying logs, Hat Creek basin, Sioux county, August 1.

309. BRYUM Dill.

862. *Bryum argenteum* L. var. *lanatum* (Brid.) Bruch & Schimp. On sandstone, Lincoln, August 26. Plentiful, but seldom fruiting.

863. *Bryum pendulum* Schimp. Dismal river, Thomas county, July 12.

864. *Bryum roseum* Schreb. Damp, shaded places on ground, Weeping Water, May 22.

310. MNIUM L.

865. *Mnium cuspidatum* Hedw. On shaded ground, very common. Lincoln; Weeping Water; Wymore; Peru.

311. TIMMIA Hedw.

866. *Timmia austriaca* Hedw. On damp ground, Belmont, July 21.

867. *Timmia megapolitana* Hedw. On ground, Lincoln; Weeping Water.

312. ATRICHUM Beauv.

868. *Atrichum undulatum* (L.) Beauv. On damp, shaded ground, Lincoln.

312½. NECKERA Hedw.

868½. *Neckera pennata* Hedw. On cedar trees, Chadron.

313. LESKEA Hedw.

869. *Leskea polycarpa* Ehrh. On ground, Lincoln; Weeping Water.

314. ANOMODON Hook. & Tayl.

870. *Anomodon obtusifolius* Bruch & Schimp. On trunks of trees, Weeping Water.

315. PYLAISIA Bruch & Schimp.

871. *Pylaisia intricata* (Hedw.) Bruch & Schimp. On trunks of trees, Lincoln, May 2.

316. CYLINDROTHECIUM Bruch & Schimp.

872. *Cylindrothecium compressum* (Hedw.) Bruch & Schimp. At base of trees, Lincoln, April 22. Common. (Barnes says of this: "It is so distinct in appearance that it almost deserves a varietal name. The branches have the leaves so compressed as to be complanate or pseudo-distichous. It may yet prove to be a new variety.")

317. HYPNUM Dill.

873. *Hypnum hispidulum* Brid. On ground, Hat Creek basin, Sioux county, August 1.

874. *Hypnum lætum* Brid. On ground, Lincoln, July.

875. *Hypnum orthocladon* Beauv. On ground, Weeping Water, May 22.

876. *Hypnum radicale* (Bruch & Schimp. ?) Beauv. Damp ground, Lincoln, May.

877. *Hypnum riparium* L. Very abundant in stagnant water. Platte river near Fremont. Used in the University for packing.

878. *Hypnum riparium* L. var. *abbreviatum* L. & J. On ground, Lincoln.

879. *Hypnum salebrosum* Hoffm. On ground, Milford, October.

880. *Hypnum serpens* L. On ground, common. Lincoln, June.

# PTERIDOPHYTA.

## CLASS I.—EQUISETINÆ.

### 69. EQUISETACEÆ.

318. EQUISETUM L. Horsetail; scouring-rush.

881. *Equisetum arvense* L. Common horsetail. Wet grounds, banks of streams, etc., common. Wymore; Lincoln; Milford; Long Pine; Weeping Water; Brownville; Anselmo; Hat Creek basin.

882. *Equisetum lævigatum* Braun. Common in low fields, pastures, etc. Lincoln; Weeping Water; Long Pine; Crete.

883. *Equisetum variegatum* Schleicher. Wet places. Long Pine (B.); Lincoln.

884. *Equisetum robustum* Braun. River banks, common. Lincoln; Brownville.

## CLASS II.—FILICINÆ.

### 70. FILICES.

319. WOODSIA R. Br.

885. *Woodsia obtusa* Torr. Canons, Long Pine, July. B.

886. *Woodsia oregana* Eaton. Dry, rather open bluffs, not uncommon. Distinguished by its inconspicuous indusium, which is divided into slender beaded hairs (of a single chain of elliptical or oblong cells). (The stems in cross-section are round, with a slight depression on one side, and contain five fibro-vascular bundles, arranged in a semicircle around the side depression. The two intermediate bundles are much smaller than the others.)

320. ONOCLEA L.

887. *Onoclea sensibilis* L. Sensitive fern. On low, wet ground, Long Pine; Antelope county; Kearney; Dismal river, Thomas county, July 12. (In large, rank patches.)

321. CYSTOPTERIS Bernh. Bladder fern.

888. *Cystopteris fragilis* (L.) Sw. Rich, wooded banks, canons, etc., common. Plattsmouth; Lincoln (rare); Long Pine; Peru; Omaha; Weeping Water; Anselmo; Belmont; Dismal river in Thomas county.

322. ASPIDIUM Sw. Shield fern; wood fern.

889. *Aspidium spinulosum* Sw. Dismal river, Thomas county, July 12. On wet, shaded banks, near the water's edge; very rank and abundant. This is the only place it is yet known to occur in Nebraska. Leaves were collected fully 2½ feet high and a foot wide at the base.

890. *Aspidium thelypteris* (L.) Sw. Damp, shaded places; low, wet bottoms among grass; very common. Long Pine (B.); Kearney; Dismal river, July 12; Thedford, July 10; Crawford, July 29.

323. ADIANTUM L. Maidenhair.

891. *Adiantum pedatum* L. In rich woods, Plattsmouth; Peru; Richardson county.

324. PELLÆA.

892. *Pellæa atropurpurea* (L.) Link. Cliff brake. Crevices of rocks, common. Peru; Weeping Water; Brownville.

325. NOTHOLÆNA R. Br.

893. *Notholæna dealbata* Kunze. Growing from crevices in the rocks, Weeping Water.

### 71. OPHIOGLOSSACEÆ.

326. BOTRYCHIUM Sw. Moonwort.

894. *Botrychium virginianum* (L.) Sw. Damp, wooded bluffs, canons, etc., common. Lincoln; Weeping Water; Belmont.

### 72. SALVINIACEÆ.

327. AZOLLA Lam.

895. *Azolla caroliniana* Willd. On ground at edge of water, Dismal river, Thomas county, July 13. Rare.

## CLASS III.—LYCOPODINEÆ.

### 73. SELAGINELLEÆ.

328. SELAGINELLA Beauv.

896. *Selaginella rupestris* (L.) Spring. Sand hills, Long Pine; Lincoln county; Cheyenne county. B.

### 74. ISOETEÆ.

329. ISOETES L. Quillwort.

897. *Isoetes melanopoda* J. Gay. Ditches, etc., very rare. Exeter. (Collected September 8, 1888, by Dr. J. Herman Wibbe.)

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# ANTHOPHYTA.

## CLASS I.—GYMNOSPERMÆ.

### 75. CONIFERÆ.

330. PINUS Tourn. Pine.

898. *Pinus ponderosa* Dougl. var. *scopulorum* Engelm. Yellow pine. The only native pine in the state. It forms the bulk of the northwestern wood region. On "Pine Ridge" from Sioux county eastward to Rock and Keya Paha counties, and in isolated canons in Custer, Valley and Greeley counties; Belmont; Hat Creek basin; Long Pine; Fort Robinson.

331. JUNIPERUS L. Juniper.

899. *Juniperus communis* L. Common juniper. Not very common. Hat Creek basin, Sioux county; Crawford; Weeping Water.

900. *Juniperus virginiana* L. Red cedar. Common. Anselmo, July 6; Dismal river, Thomas county, July 13; Belmont, July 26; Hat Creek basin, Sioux county, August 2; Long Pine. On high rocky places it is frequently almost prostrate. In other places commonly a a magnificent tree. A section of a trunk from Custer county, in the University cabinet, measures nearly two feet in diameter.

## CLASS II.—ANGIOSPERMÆ.

### *Sub-Class I.—Monocotyledones.*

### 76. NAIADACEÆ. (PONDWEED FAMILY.)

332. ZANNICHELLIA L. Horned pondweed.

901. *Zannichellia palustris* L. Horned pondweed. Common in running streams and ponds. Lincoln, October; Dismal river, Thomas county, July 12. Nutlets pod-like 3–4 millimetres long and 1 wide, beaked by a presistent style about 1 millimetre in length, winged margined, and toothed.

333. Ruppia L. Ditch grass.

902. *Ruppia maritima* L. Ditch grass. Common in streams and ponds around Lincoln. A form of this with the rather large leaves collected at the summit and conspicuously distichous, resembling a fan with exceedingly long (1–2 feet) spiral peduncle, seems to be the foreign var. *pedunculata* Hartman. It is very plentiful in Grand lake, southwest of Alliance.

334. Potamogeton L. Pondweed.

903. *Potamogeton hybridus* Michx. Ponds and sluggish streams, common, Lincoln.

904. *Potamogeton natans* L. Ponds, Lincoln; Geneva.

905. *Potamogeton pauciflorus* Pursh. In ponds, etc., August, Lincoln.

906. *Potamogeton rufescens* Schrad. Cass county. W.

335. Triglochin L. Arrow grass.

907. *Triglochin maritimum* L. Arrow grass. Low, wet prairies, rare. Thedford, July 11; Alliance, August 7.

## 77. ALISMACEÆ. (WATER PLANTAIN FAMILY.)

336. Sagittaria L. Arrow head.

908. *Sagittaria graminea* Michx. Arrow head. Edges of ponds, rare. Lincoln, June.

909. *Sagittaria variabilis* Engelm. Common arrow head. Edges of ponds, very common. July. Lincoln; Weeping Water; Antelope county; Anselmo; Thedford; Belmont; Sioux county.

337. Alisma L. Water plantain.

910. *Alisma plantago* L. var. *triviale* (Pursh.) B. S. P. (var. *americana* Gray). Water plantain. Edges of ponds, wet prairies, etc.; rare. Holmesville, July; Anselmo, July 6.

## 78. LEMNACEÆ. (DUCKWEED FAMILY.)

338. Spirodela Schleid. Duckweed; duck's meat.

911. *Spirodela polyrrhiza* (L.) Schleid. Common duckweed. Floating on ponds and creeks, very common. Lincoln; Weeping Water; Anselmo, July 6; Thedford, July 11; Belmont, July 24.

339. Lemna L. Duckweed; duck's meat.

912. *Lemna minor* L. Little duckweed. On ponds, not so common as the preceding. Anselmo, July 6; Thedford, July 11; Lincoln.

913. *Lemna trisulca* L. Duckweed. In stagnant ponds, not common. Fremont; Thedford, July 11. What is apparently a very small form of this I have in considerable quantity from Thedford. Collected July 11, sometimes in the same ponds with the normal form. It is quite distinct, being much smaller and of a darker green color. The fronds are oblong-lanceolate from 3–4½ or rarely 5 millimetres long, by from 1–2 millimetres wide.

## 79. AROIDEÆ. (ARUM FAMILY.)

340. Arisæma Martius. Indian turnip; dragon arum.

914. *Arisæma dracontium* Schott. Green dragon or dragon-root. Woods, rare. Weeping Water; Crete.

915. *Arisæma triphyllum* (L.) Torr. Indian turnip, or Jack-in-the-pulpit. Rich woods, common in eastern Nebraska. May. Lincoln; Milford; Weeping Water; Crete.

341. ACORUS L. Calamus; sweet flag.

916. *Acorus calamus* L. Calamus or sweet flag. Wet places, rare, probably limited to the extreme eastern part of the state. Nebraska City, June.

### 80. TYPHACEÆ. (CAT-TAIL FAMILY.)

342. SPARGANIUM L. Bur-reed.

917. *Sparganium eurycarpum* Engelm. Bur-reed. Edges of ponds, common. Lincoln; Peru; Belmont; Anselmo.

343. TYPHA L. Cat-tail flag.

918. *Typha latifolia* L. Common cat-tail. Wet places, common. Lincoln; Weeping Water; Peru; Anselmo; Alliance; Thedford; Belmont.

### 81. CYPERACEÆ. (SEDGE FAMILY.)

344. CAREX L. Sedge.

919. *Carex cephaloidea* Dewey. Lincoln; Crete; Weeping Water.

920. *Carex crus-corvi* Shuttlew. Edges of ponds, common. Lincoln.

921. *Carex eburnea* Boott. Nebraska. (Gray's Manual, p. 510.)

922. *Carex filiformis* L. Hardy. U.

923. *Carex gravida* Bailey. Lincoln. (Only specimen collected was sent to Prof. Bailey for identification.)

924. *Carex grisea* Wahl. Nebraska. (Hayden. Coulter's Manual.)

925. *Carex hystricina* Muhl. Low prairies, Lincoln; Weeping Water.

926. *Carex jamesii* Torr. var. *nebraskensis* (Dew.) Bailey. Nebraska. (Coulter's Manual, p. 384.)

927. *Carex laxiflora* Lam. Low prairie, Lincoln. Hardy.

928. *Carex longirostris* Torr. Nebraska. (Gray's Manual, p. 603.)

929. *Carex muricata* L. Weeping Water. W.

930. *Carex rosea* Schk. Damp woods, rare. Weeping Water; Lincoln; Nebraska City.

931 *Carex shortiana* Dew. Nebraska City. (Hayden, in Coulter's Manual, p. 379.)

932. *Carex stenophylla* Wahl. Hardy. U.

933. *Carex straminea* Schk. Crete; Lincoln; Hitchcock county.

934. *Carex straminea* Schk. var. *mirabilis* (Dewey) Tuck. (*C. mirabilis* Dewey.) Nebraska. (Coulter's Manual.)

935. *Carex stricta ?* Lam. Lincoln.

936. *Carex tetanica* Schk. var. *meadii* Bailey. Low prairie, Lincoln.

937. *Carex trisperma* Dewey. Weeping Water. W.

938. *Carex tribuloides* Wahl. var. *bebbii* Bailey. Low prairie, Lincoln.

939. *Carex trichocarpa* Muhl. var. *imberis* Gray. Lincoln.

940. *Carex vulpinoidea* Michx. Low places, quite common. Nebraska City; Lincoln; Crete.

345. ERIOPHORUM L. Cotton grass.

941. *Eriophorum virginicum* L. Cotton grass. Nebraska. (Gray's Manual, p. 583.)

346. SCIRPUS L. Bulrush or club-rush.

942. *Scirpus atrovirens* Muhl. Bulrush. Wet places, common. Lincoln; Crete; Weeping Water.

943. *Scirpus atrovirens* Muhl. var. *pallidus* Britton. Hitchcock county.

944. *Scirpus debilis* Pursh. Nebraska. (Gray's Manual, p. 580.)

945. *Scirpus fluviatilis* (Torr.) Gray. Ponds, Lincoln; Weeping Water.

946. *Scirpus lacustris* L. (*S. validus* Vahl.) Ponds, etc., common. Lincoln; Weeping Water; Crete.

947. *Scirpus maritimus* L. Edges of ponds, common. Lincoln; Hardy.

948. *Scirpus pungens* Vahl. Low prairies, Louisville; Anselmo; Broken Bow.

347. ELEOCHARIS R. Brown. Spike-rush.

949. *Eleocharis acicularis* (L.) R. Br. Edges of ponds, common. Lincoln; Louisville; Thedford.

950. *Eleocharis ovata* (Roth.) R. Br. (*E. obtusa* Schult.) Ponds, common. Lincoln.

951. *Eleocharis palustris* (L.) R. Br. Lincoln.

348. CYPERUS L. Galingale.

952. *Cyperus aristulatus* Rottb. (*C. inflexus* Muhl.) Low grounds. Lincoln; Weeping Water.

953. *Cyperus engelmanni* Steud. Louisville. W.

954. *Cyperus esculentus* L. (*C. phymatodes* Muhl.) Banks of creeks, etc., common. Lincoln; Weeping Water.

955. *Cyperus filiculmis* Vahl. Low grounds. Lincoln.

956. *Cyperus schweinitizii* Torr. Louisville; Howard county; Broken Bow; Anselmo; Thedford.

957. *Cyperus speciosus* Vahl. (*C. michauxianus* Schultes.) Lincoln; Hardy.

## 82. GRAMINEÆ. (GRASS FAMILY.)

349. ELYMUS L. Wild rye; Lyme grass.

958. *Elymus canadensis* L. Common wild rye. Roadsides, everywhere, very common. Lincoln; Crete; Valentine; Fairfield; Hardy; Weeping Water; Geneva; Long Pine; Howard county; Furnas county; Polk county; Valley county; Anselmo; Thedford. A form of this, having the spike partially enclosed in the sheath of the upper leaf, is common at Thedford.

959. *Elymus canadensis* L. var. *glaucifolius* (Muhl.) Gray. Louisville, Cass county.

960. *Elymus condensatus* Presl. Wild rye. Valley county.

961. *Elymus striatus* Willd. Wild rye. In damp woods, shaded canons, etc., Thedford, July 11; Anselmo, July 6; Dismal river, in Thomas county, July 12; Long Pine, July. A slender species, distinguished from *E. sibericus* chiefly by its 1–2 flowered spikelets.

962. *Elymus virginicus* L. Wild rye. Woods and copses along roadsides, very common. Seward; Lincoln; Crete; Weeping Water; Tecumseh; Peru. Distinguished by its enlarged upper sheaths, enclosing the base of the spikes.

350. HORDEUM L. Barley.

963. *Hordeum jubatum* L. Squirrel-tail grass. Prairies, roadsides, waste places, etc., very common. Weeping Water; Hastings; Lincoln; Furnas county; Valley county; Anselmo; Thedford; Crawford. Useful only as an ornamental grass for flower designs and decorations.

964. *Hordeum nodosum* L. Barley grass. Prairie and waste places, common. Lincoln; Hardy; Weeping Water; Furnas county; Thedford. Apparently worthless as an agricultural grass.

351. AGROPYRUM J. Gærtn. Wheat grass.

965. *Agropyrum glaucum* R. & S. Common wheat grass. Prairies through-

out the state, very common. Valentine; Lincoln; Crete; Cambridge; Culbertson; Hardy; Hastings; Howard county; Furnas county; Anselmo; Thedford; Belmont. Perhaps the most valuable of our native grasses. Distinguished by its narrow, quickly attenuated glumes and glaucous, rigid appearance.

966. *Agropyrum repens* (L.) Beauv. Couch, quack, or quitch grass. Low prairies, not uncommon. Valley county; Belmont; Anselmo. Distinguished from the preceding by its larger glumes, with an obtuse or two-notched apex, bearing usually a short awn; and more prominent and numerous veins. The spikelets are closer appressed to the stem and the glumes more nearly surround the flowers than in *Agropyrum glaucum*. This, with the strongly ribbed glumes, gives the head a more compact and striate appearance. Whole plant less rigid.

967. *Agropyrum tenerum* Vasey. Wheat grass. Common in the damp valleys and wooded canons of the northwestern part of the state. Altitude 3800–5000 feet. Belmont, July 18; Crawford, July 29; Hat Creek basin, Sioux county, August 2. Very similar to *A. repens*, from which it is distinguished chiefly by wanting the running root stalk, more fragile narrower leaves, more slender spike, and fewer flowered (3–5) spikelets.

968. *Agropyrum unilaterale* Vasey & Scrib. Wheat grass. Low prairies, not common. Thedford, Thomas county, August 7.

352. LOLIUM L. Darnel.

969. *Lolium* PERENNE L. Common darnel, ray or rye grass. Waste places; escaped. Lincoln.

353. BROMUS L. Brome grass.

970. *Bromus breviaristatus* Thurb. In wooded ravines, rare, probably limited to the western region. Belmont, Dawes county, July 18, 1889.

971. *Bromus ciliatus* L. Hairy brome grass. Usually in shaded places, common. Lincoln; Roca; Peru; Valentine; Weeping Water; Hitchcock county; Belmont; Marsland; Thedford; Dismal river, Thomas county.

972. *Bromus kalmii* Gray. Wild chess. In woods. Belmont, July 18; Thedford, July 15.

973. *Bromus kalmii* Gray var. *porteri* Coulter. In canons, etc., common. Hat Creek basin, August 2.

974. *Bromus* RACEMOSUS L. Upright chess. Fields, rare. Escaped from cultivation. Lincoln.

975. *Bromus* SECALINUS L. Cheat or chess. Roadsides, fields, etc., introduced, becoming common. Lincoln; Hastings.

354. FESTUCA L. Fescue grass.

976. *Festuca* ELATIOR L. Taller or meadow fescue. Lincoln. W.

977. *Festuca nutans* Spreng. Fescue grass. Lincoln; Hardy; Weeping Water.

978. *Festuca ovina* L. Sheep's fescue. Prairies, common. Furnas county; Valley county; Lincoln; Weeping Water.

979. *Festuca scabrella* Torr. Bunch grass. Custer county.

980. *Festuca tenella* Willd. Fescue grass. Prairies, Hitchcock county; Howard county; Thomas county.

REDFIELDIA Vasey.

981. *Redfieldia flexuosa* Vasey. Torr. Bull., vol. XIV (1887), p. 133, pl. LXX. Blow-out grass. Very dry, sandy soil, frequently in "blow-outs." Dismal river in Thomas county, July 13, 1887; Valentine,

Cherry county. Easily distinguished by its long leaves; spreading panicle; compressed, 3-5 flowered spikelets, which are hairy at the base and on the short rachilla; three-nerved flowering glumes and bidentate palet, which is folded lengthwise in the middle, and the edges from the two nerves outward sharply infolded, forming two seemingly marginal longitudinal keels.

356. GLYCERIA R. Br. Manna grass.

982. *Glyceria arundinacea* Kunth. Water grass. In edge of water, rare. Thedford, in the Loup river, and Dismal river; both in Thomas county. Rank, from 2-3 feet high, frequently with a panicle fully 16 inches long.

983. *Glyceria distans* (L.) Wahl. Water grass. In damp, shaded canons, rare. Belmont, Dawes county, July 25. A small, slender grass, about 30 centimetres high, with an open panicle and spreading, frequently reflexed rays.

984. *Glyceria nervata* (Willd.) Trin. Fowl-meadow grass or ribbed water grass. Valley county, Anselmo, July 6; Thedford, July 11; Hat Creek basin, August 2; Broken Bow, July 4; Valley county. Flowering glume, strongly 7 nerved, giving the spikelet a beautiful striate appearance.

357. POA L. Meadow grass; spear grass.

985. *Poa andina* Nutt. Mountain spear grass. Wet places, canons, etc., not common. Lancaster county; Chase county; Howard county; Hardy; Weeping Water; Thedford.

986. *Poa* ANNUA L. Goose grass. Introduced. Lincoln. W.

987. *Poa cæsia* ? Smith. Damp canons. Belmont. A very peculiar variety, if indeed it can be considered as belonging here. Dr. Vasey says it may prove to be a new species.

988. *Poa nemoralis* L. In damp canons. Belmont, Dawes county, July 25.

989. *Poa compressa* L. Wire grass. Low prairies, not very common. Lincoln; Weeping Water; Cuming county.

990. *Poa* PRATENSIS L. Kentucky blue grass, June grass, etc. Prairies and waste places, common. Introduced. Lincoln; Crete; Weeping Water; Geneva.

991. *Poa serotina* Ehrh. Fowl-meadow grass. Valley county.

992. *Poa tenuifolia* Nutt. Oregon blue grass. Damp canons, rare. Belmont July 18.

358. DISTICHLIS Raf. Spike grass.

993. *Distichlis spicata* (L.) Greene var. *stricta* Thurber. (*Brizopyrum spicatum* Hook. and *Distichlis maritima* Raf.) Salt grass. Low, and usually alkaline prairies, common. Hitchcock county; Lincoln; Hardy; Alliance; Anselmo.

359. DACTYLIS L. Orchard grass.

994. *Dactylis* GLOMERATA L. Orchard grass. Roadsides and waste places, common. Introduced. Lincoln; Weeping Water; Furnas county.

360. DIARRHENA Raf.

995. *Diarrhena americana* Beauv. Low places, Cass county. Rare.

361. MELICA L.

996. *Melica porteri* Scribner. Woods, rare. Weeping Water, May 21.

362. ERAGROSTIS Beauv.

997. *Eragrostis capillaris* (L.) Nees. Eragrostis. Weeping Water. W.

998. *Eragrostis* MAJOR Host. Stink or candy grass. Waste places, very

common. Lincoln; Crete; Valentine; Hardy; Tecumseh; Weeping Water; Cambridge; Broken Bow; Thedford; and Hitchcock, Howard, Furnas, and Polk counties.

999. *Eragrostis pectinacea* (Michx.) Gray. "False red top." Waste places, common. Lincoln; Valentine; Weeping Water; Hardy.

1000. *Eragrostis purshii* Schrad. Eragrostis. Waste places, not uncommon. Weeping Water; Broken Bow; Howard county.

1001. *Eragrostis reptans* (Michx.) Nees. Low, wet places, borders of ponds, etc., common. Lincoln; Weeping Water.

1002. *Eragrostis tenuis* (Ell.) Gray. Blow-out grass. In sandy places, frequently in "blow-outs." Dismal river, Thomas county, July 13; Howard county; Valentine.

363. CATABROSA Beauv.

1003. *Catabrosa aquatica* (L.) Beauv. Water grass. In edges of ponds and streams, rare. Dismal and Loup rivers, in Thomas county. Oldish specimens may readily be taken for *Sporobolus* by the dropping of the one or two upper flowers, leaving the spikelet apparently one-flowered. The rachis breaks off at the base of the palet of the lower flower between the two nerves and is easily overlooked.

364. EATONIA Raf. Eatonia.

1004. *Eatonia obtusata* (Michx.) Gray. Prairie grass. Rather low prairies, common. Lincoln; Weeping Water; Furnas county; Thedford; Hat Creek basin, Sioux county.

1005. *Eatonia obtusata* (Michx.) Gray, var. *robusta* Vasey. Low prairies. Thedford, July 14; Broken Bow, July 4; Belmont, July 25.

1006. *Eatonia pennsylvanica* (Spreng.) Gray. Damp woods in canons, rare. Belmont, July 18. A very slender grass with a loose panicle, thus easily distinguished from the two preceding.

365. KŒLERIA Pers.

1007. *Kœleria cristata* Pers. June grass. Prairies, common. Valentine; Lincoln; Crete; Hardy; Fort Robinson; Weeping Water; Broken Bow; Thedford; Belmont; and Hitchcock, Howard, and Valley counties.

366. MUNROA Torr.

1008. *Munroa squarrosa* Torr. False buffalo grass. Dry banks and prairies, common. McCook, Fort Robinson; Belmont; Anselmo; Thedford.

367. PHRAGMITES Trin. Reed grass.

1009. *Phragmites vulgaris* (Lam.) B. S. P. (*P. communis* Trin.) Edges of ponds, common. Alliance; Anselmo; Lincoln; Weeping Water; Valentine; Howard county; Kearney county.

368. TRIPLASIS Beauv.

1010. *Triplasis purpurea* (Walt.) Chapm. Sand grass. Valentine (Bates). U.

369. TRIODIA R. Br.

1011. *Triodia seslerioides* (Michx.) Benth. (*Tricuspis seslerioides* Torr.) Tall red-top. Roadsides, Richardson county, August 24. A very beautiful grass, about three feet high, with large, shiny, reddish-brown, 5–7 flowered spikelets, which are about 7 or 8 millimetres in length.

370. BUCHLOE Engelm.

1012. *Buchloe dactyloides* Engelm. Buffalo grass. Prairies, common. Once the predominating grass, now found only in small patches, becoming in some places quite rare. Lincoln; Crete; Franklin; Valentine; Weeping Water; McCook; Broken Bow; Anselmo; Thedford; Alliance; Crawford; Harrison, Hitchcock county; Furnas county.

371. BOUTELOUA Lag. Mesquite grass.

1013. *Bouteloua hirsuta* Lag. Bristly mesquite grass. Prairies, common. Dundy county; Hastings; Weeping Water; Valentine; Fort Robinson; Belmont; Harrison.

1014. *Bouteloua oligostachya* Torr. "Gramma." Prairies, common. Hitchcock, Howard, Furnas, Dundy, and Valley counties; Valentine; Weeping Water; Hardy; Harrison; Belmont; Thedford.

1015. *Bouteloua racemosa* Lag. Mesquite grass. Common on prairies, etc. Hitchcock, Furnas, Chase, Polk, and Valley counties; Lincoln; Valentine; Hardy; Weeping Water; Crete; Fort Robinson; Cambridge; Hastings.

372. SCHEDONNARDUS Steud.

1016. *Schedonnardus texanus* Steud. Wire grass. Prairies, common. Furnas, Hitchcock, and Valley counties; Lincoln; Weeping Water; Belmont; Anselmo; Thedford. Apparently a worthless grass that cattle shun.

373. CALAMAGROSTIS Adans. Reed bent grass.

1017. *Calamagrostis canadensis* (Michx.) Beauv. Blue-joint grass. Prairies; not so common as the next. Hitchcock and Valley counties.

1018. *Calamagrostis longifolia* Hook. Sand grass. Dry prairies; very common in sandy places. Hitchcock, Dundy, and Box Butte counties; Valentine; Fort Robinson; Belmont; Anselmo; Harrison; Dismal river in Thomas county.

1019. *Calamagrostis stricta* Trin. Yellow-top. Low prairies, canons, etc.; common in the western part of the state. Valley county; Anselmo, Hat Creek basin in Sioux county. Some valleys in Sioux county have an almost exclusive growth of this. It is reported as a very valuable grazing grass.

374. CINNA L.

1020. *Cinna pendula* Trin. (*C. arundinacea* L. var. *pendula* Gray.) Wood reed grass. In woods, Lincoln; Weeping Water.

375. AGROSTIS L. Bent grass.

1021. *Agrostis alba* L. Wooded canons and low prairies; common. Broken Bow; Thedford; Belmont; Hat Creek basin in Sioux county.

1022. *Agrostis alba* L. var. VULGARIS (With.) Thurb. (*A. vulgaris* With.) Red-top. Furnas county; Lincoln; Weeping Water; Broken Bow.

1023. *Agrostis exerata* Trin. Northern red-top; mountain red-top. Wet places in canons. Belmont; Hat Creek basin in Sioux county; Lincoln. Distinguished from *A. alba* chiefly by the smaller size of the palet, being reduced to a mere scale, or almost entirely wanting.

1024. *Agrostis perennans* (Walt.) Tuck. Thin grass. Cass county.

1025. *Agrostis hiemalis* (Walt.) B. S. P. (*A. scabra* Willd.) Hair grass; fly away grass. Prairies, etc., common. Crete; Weeping Water; Broken Bow; Anselmo; Belmont; Thedford; Hitchcock county; Howard county; Furnas county.

376. SPOROBOLUS R. Br. Drop-seed grass; rush grass.

1026. *Sporobolus airoides* (Steud.) Torr. Alkali grass. Alkaline prairies, common. Valley county; Valentine; Alliance.

1027. *Sporobolus asper* (Michx.) Beauv. Prairie grass. Howard county; Valentine; Lincoln.

1028. *Sporobolus asperifolius* (N. & M.) Thurb. Prairie grass. Dry prairies. Alliance; Weeping Water; Hitchcock county.

1029. *Sporobolus cuspidatus* Torr. Prairie grass, common on rather low prairies. Cass county; Polk county; Belmont; Hat Creek basin in Sioux county.

1030. *Sporobolus cryptandrus* (Trin.) Gr. Prairie grass. Prairies, etc., quite common. Hitchcock county; Valley county; Anselmo; Thedford; Crawford. Reported by farmers as an excellent grass for hay and pasturage.

1031. *Sporobolus depauperatus* Torr. Alliance (S.); Valentine (Bates). U.

1032. *Sporobolus heterolepis* Gray. Roadsides, Lincoln.

1033. *Sporobolus vaginæflorus* (Torr.) Vasey. Low prairies and waste places, common. Lincoln; Hardy; Brownville; Weeping Water.

377. PHLEUM L. Timothy; cat's-tail grass.

1034. *Phleum* PRATENSE L. Common Timothy. Common, escaped to waste places and roadsides. Lincoln; Crete; Brownville; Tecumseh; Geneva; Weeping Water; Hitchcock county; Furnas county; Anselmo; Thedford; Belmont.

378. BRACHYELYTRUM Beauv.

1035. *Brachyelytrum aristosum* (Michx.) B. S. P. (*B. aristatum* Beauv.) Cass county.

379. MUHLENBERGIA Schreb. Muhlenberg's grass.

1036. *Muhlenbergia comata* (Thurb.) Benth. Nebraska. (Coulter's Manual.)

1037. *Muhlenbergia diffusa* Schreb. Drop-seed, or nimble Will. Dry hills, etc. Valley county; Lincoln; Geneva.

1038. *Muhlenbergia mexicana* (L.) Trin. Wood grass. Low grounds. Hitchcock county; Howard county; Weeping Water.

1039. *Muhlenbergia mexicana* (L.) Trin., var. *filiformis* Vasey. Lincoln. S.

1040. *Muhlenbergia pungens* Thurb. "Blow-out" grass. Sandy prairies, common. Long Pine; Dismal river in Thomas county; Belmont; Hat Creek basin in Sioux county. Leaves very pale and rigid; panicle open, reddish or purplish; palet in my specimens about one-half as long as the flowering glume, with two short setose points.

1041. *Muhlenbergia racemosa* (Michx.) B. S. P. (*M. glomerata* Trin.) Muhlenberg's grass. Waste places, in damp canons, etc., common. Howard county; Polk county; Belmont; Weeping Water; Valentine; Hardy; Lincoln.

380. ORYZOPSIS Michx. Mountain rice.

1042. *Oryzopsis cuspidata* (Nutt.) Benth. Dry prairies. Fort Robinson.

1043. *Oryzopsis micrantha* (Trin. & Rupr.) Thurb. (*Urachne micrantha* Trin. & Rupr.) Edges of water. Dismal river in Thomas county; Fort Robinson; Belmont. Awn about 1 centimetre long, very deciduous, springing from the apex of the flowering glume; in Nebraska specimens the base is surrounded by a little tuft of hairs. Oblong grain, closely inclosed by the palets, falling easily.

381. STIPA L. Feather grass.

1044. *Stipa comata* Trin. & Rupr. Porcupine grass. Very common in the western part of the state, replacing *S. spartea*, which in the eastern region is common. Fort Robinson; Broken Bow; Belmont; Thedford; Harrison.

1045. *Stipa spartea* Trin. Porcupine grass. Prairies in the eastern part of the state, common. Lincoln; Crete; Weeping Water; Gordon.

1046. *Stipa viridula* Trin. Low prairies, rare. Belmont, July 18. Distinguished from *S. comata* and *S. spartea* by its shorter (2½–4 cm.), twice bent awn; and small, short, flowering glume (5–6 millimetres long).

382. **ARISTIDA** L. Triple awned grass.

1047. *Aristida basiramea* Engelm. Beard grass. Prairies, not uncommon. Howard county; Broken Bow; Exeter.

1048. *Aristida purpurea* Nutt. Beard grass. Prairies, common. Hitchcock county; Dundy county; Broken Bow; Anselmo; Thedford; Belmont. A worthless bunch grass which is always left by cattle.

1049. *Aristida purpurea* Nutt. var. *hookeri* Tr. In bunches on high prairies. Belmont, August 4.

383. **ALOPECURUS** L. Fox-tail grass.

1050. *Alopecurus alpinis* Sm. Prairies, rare. Rushville, July 29. U.

1051. *Alopecurus geniculatus* L. Water fox-tail. Low, wet places. Lincoln.

1052. *Alopecurus geniculatus* L. var. *aristulatus* (Michx.) Munro. Floating, or water foxtail. Plattsmouth; Belmont; Hat Creek basin, in Sioux county; Dismal river, in Thomas county. Common westward on wet, sandy soil.

1053. *Alopecurus* PRATENSIS L. Meadow fox-tail. Introduced. Lincoln.

384. **PHALARIS** L. Canary grass.

1054. *Phalaris arundinacea* L. Reed canary grass. Wet grounds, common. Lincoln.

1055. *Phalaris* CANARIENSIS L. Canary grass. Yards and waste places, common. Introduced. Lincoln; Crete.

385. **ANDROPOGON** L. Beard grass.

1056. *Andropogon hallii* Hack. Turkey-foot grass. Common on high lands in the western and central parts of the state. Howard, Furnas, and Cherry counties; Valentine; Long Pine; Fort Robinson; Thedford; Belmont; and Hat Creek basin, in Sioux county.

1057. *Andropogon nutans* L. (*Chrysopogon nutans* Benth. of Gray's Manual.) Bushy blue stem. Prairies, common. Hitchcock, Furnas, Valley, and Polk counties; Lincoln; Valentine; Crete; Hardy; Geneva; Weeping Water; Long Pine; Thedford.

1058. *Andropogon provincialis* Lam. (*Andropogon furcatus* Muhl. of Gray's Manual.) Big blue stem. Prairies and roadsides, common. Howard, Furnas, and Dundy counties; Lincoln; Weeping Water; Crete; Valentine; Hardy; Geneva; Cambridge; Long Pine; Thedford; Anselmo; Belmont.

1059. *Andropogon scoparius* Michx. Little blue stem, or red stem. Common on prairies — usually in compact bunches. Furnas county; Valley county; Lincoln; Valentine; Hardy; Fort Robinson; Geneva; Weeping Water; Long Pine; Hastings; Belmont; Anselmo.

1060. *Andropogon* SORGHUM Brot. var. HALEPENSIS (Nees.) Hack. Johnson grass. Escaped in places. Howard county; Hitchcock county.

386. **LEERSIA** Swartz.

1061. *Leersia oryzoides* (L.) Swartz. Rice cut-grass. Waste places, rare. Hitchcock county; Dundy county; Lincoln; Weeping Water.

1062. *Leersia virginica* Willd. White grass. Wooded banks of streams, etc., common. Hitchcock county; Lincoln; Weeping Water.

387. **ZIZANIA** L. Wild rice.

1063. *Zizania aquatica* L. Wild rice, also called water or Indian rice, water oats, etc. Edges of ponds; not uncommon in the eastern and central parts of the state. Lincoln; Weeping Water; Howard, Furnas, and Hitchcock counties.

388. **TRIPSACUM** L. Gama grass; sesame grass.

1064. *Tripsacum dactyloides* L. Low places. Rare. Weeping Water.

389. SPARTINA Schreb. Cord, or marsh grass.

1065. *Spartina cynosuroides* (L.) Willd. Cord grass. Edges of ponds and streams, common. Hitchcock county; Lincoln; Valentine; Geneva; Weeping Water; Long Pine; Anselmo; Thedford; Hat Creek basin in Sioux county.

1066. *Spartina gracilis* Trin. On the Platte river in Cheyenne county, August. Rare.

390. CENCHRUS L. Bur, or hedge-hog grass.

1067. *Cenchrus tribuloides* L. Sand-bur. Waste places, too common. Lincoln; Weeping Water; Peru; Long Pine; Thedford; Polk county. This is as yet rare in the western region.

391. SETARIA Beauv.

1068. *Setaria* GLAUCA (L.) Beauv. Yellow fox-tail. Waste places, fields, etc., common. Lincoln; Weeping Water; Peru; Furnas county; Belmont.

1069. *Setaria* ITALICA (L.) Kunth. Millet, or Bengal grass. Waste places; escaped. Hitchcock, Howard, and Valley counties; Anselmo; Lincoln.

1070. *Setaria* VIRIDIS (L.) Beauv. Green fox-tail; bottle grass. Waste places, common. Hitchcock, Polk, Howard, and Valley counties; Lincoln; Crete; Weeping Water; Hardy; Broken Bow; Belmont; Thedford.

392. PANICUM L. Panic grass.

1071. *Panicum agrostoides* Muhl. Red-top panicum. Rare. Valley county.

1072. *Panicum capillare* L. Old witch grass; tickle grass. Very common in waste places, edges of cultivated fields, etc. Valley, Dundy, Hitchcock, Furnas, and Polk counties; Lincoln; Crete; Weeping Water; Belmont; Broken Bow; Dismal river in Thomas county.

1073. *Panicum capillare* L. var. *macrospermum* Vasey. Roadsides, etc., more rare. Belmont, July 24. Smaller than the preceding, with more simple panicle and rather larger spikelets.

1074. *Panicum* CRUS-GALLI L. Barn-yard grass. Yards and waste places, common. Lincoln; Crete; Chadron; Cambridge; Weeping Water; Long Pine; Hastings; and Hitchcock, Furnas, and Valley counties.

1075. *Panicum* CRUS-GALLI L. var. HISPIDUM (Muhl.) Torr. Waste places, usually with the preceding. Lincoln.

1076. *Panicum depauperatum* Muhl. Panic grass. Rare. Valley county.

1077. *Panicum dichotomum* L. Prairies; not so common as *P. scoparium*, with which it is frequently confounded. Thedford, July 10; Howard county.

1078. *Panicum filiforme* L. Nebraska. (Gray's Manual, p. 630.)

1079. *Panicum proliferum* Lam. Panic grass. Waste places, common. Lincoln; Weeping Water.

1080. *Panicum* SANGUINALE L. Crab grass; finger grass. Waste places, common. Lincoln; Weeping Water; Hardy; Broken Bow.

1081. *Panicum scoparium* Lam. Small panic grass. On prairies, very common. Lincoln; Weeping Water; Belmont; Broken Bow; Thedford; Anselmo. Frequently confounded with *P. dichotomum*, from which it may easily be distinguished by its fewer flowered, more simple panicle, larger tumid spikelets, 9 nerved upper glume, and the transverse fold or furrow near the base of the flowering glume.

1082. *Panicum virgatum* L. Switch grass. Prairies and waste places, very common. Hitchcock, Howard, Furnas, Dundy, and Valley counties; Lincoln; Valentine; Hardy; Weeping Water; Cambridge; Long Pine; Broken Bow; Thedford; Dismal river in Thomas county; Belmont.

1083. *Panicum virgatum* L. var. *glaucum* Vasey. Thedford, July 10. A smaller upland or dry ground form, more slender and glaucous than the type, geniculate below.

393. BECKMANNIA Host.

1084. *Beckmannia erucæformis* Host. In dry canon, Anselmo, July 6. Specimens have also been sent from Valentine (Bates). A very beautiful grass, rare.

394. PASPALUM L.

1085. *Paspalum setaceum* Michx. Bead grass. Waste places, rare. Thedford and Dismal river, in Thomas county; Howard and Lancaster counties.

### 83. COMMELINACEÆ. (SPIDERWORT FAMILY.)

395. TRADESCANTIA L. Spiderwort.

1086. *Tradescantia virginica* L. Common spiderwort. Usually on low grounds, but spreading in the central region upon the sand hills. Lincoln; Weeping Water; Fairbury, Valentine; Fort Robinson; Anselmo, July 6; Belmont, July 24; Thedford, July 11.

396. COMMELINA L.

1087. *Commelina virginica* L. On sand hills in shade of large weeds and shrubs. Long Pine; Thedford, July 11.

### 84. JUNCACEÆ. (RUSH FAMILY.)

397. JUNCUS Tourn. Rush; bog-rush.

1088. *Juncus filiformis* L. Nebraska. (Gray's Manual, p. 540.)

1089. *Juncus nodosus* L. var. *megacephalus* Torr. Prairies. Louisville; Crete.

1090. *Juncus scirpoides* Lam. var. *echinatus* Engelm. Wet places; not uncommon. Lincoln.

1091. *Juncus tenuis* Willd. Low prairies; common. Lincoln; Weeping Water; Crete.

### 85. LILIACEÆ. LILY FAMILY.

398. ZYGADENUS Michx.

1092. *Zygadenus elegans* Pursh. Fort Robinson, May, 1890. (Collected by Rev. J. M. Bates.) U.

398½. DISPORUM Salisb.

1092½. *Disporum trachycarpum* (Watson) Benth. & Hook. (*Prosartes trachycarpa* Watson. At base of high bluffs. Hat Creek basin in Sioux county, August 2. Rare.

399. UVULARIA L.

1093. *Uvularia sessilifolia ?* L. (*Oakesia sessilifolia* (L.) Watson.) Nebraska. (Gray's Manual, p. 528.)

400. CHAMÆLIRIUM Willd. Devil's-bit.

1094. *Chamælirium carolinianum* Willd. Blazing star. Nebraska. (Gray's Manual, p. 532.)

401. CALOCHORTUS Pursh.

1095. *Calochortus gunnisoni* Watson. Wooded sides of bluffs. Fort Robinson; Belmont; Hat Creek basin.

402. ERYTHRONIUM L.

1096. *Erythronium albidum* Nutt. "Spring Lily," White dog's-tooth violet. Open woods; common in the eastern part of the state. April. Lincoln; Plattsmouth; Wymore; Weeping Water.

1097. *Erythronium americanum* Ker. Yellow adder's-tongue. Wooded bluffs of the Missouri river. April. Peru.

403. LILIUM L. Lily.

1098. *Lilium canadense* L. Wild yellow lily. Otoe county; Weeping Water; July.

404. ALLIUM L. Onion; garlic.

1099. *Allium canadense* Kalm. Wild garlic. Lincoln; Crete.

1100. *Allium mutabile* Michx. Prairie onion. Low prairies; common. Antelope county; Lincoln; Weeping Water; Crete; Thedford, July 14.

1101. *Allium nuttallii* Watson. Prairies. Antelope county.

1102. *Allium stellatum* Fraser. Wild onion. Sides of wooded bluffs. Belmont, July 18; Hat Creek basin, in Sioux county, August 2.

405. NOTHOSCORDUM Kunth.

1103. *Nothoscordum striatum* (Jacq.) Kunth. Nebraska. (Coulter's Manual.)

406. LEUCOCRINUM Nutt.

1104. *Leucocrinum montanum* Nutt. McCook, and Cheyenne county.

407. YUCCA L. Spanish bayonet.

1105. *Yucca angustifolia* Pursh. Spanish bayonet; Indian soap-weed. Prairies, very common in the central part of the state, and westward. Box Butte county; Broken Bow; Thedford; Dismal river, in Thomas county; Belmont; Alliance.

408. SMILACINA Desf. False Solomon's seal.

1106. *Smilacina amplexicaulis* (Watson) Nutt. Wooded banks and canons, common in the central and western parts of the state. Fort Robinson; Fremont; Anselmo, July 6; Belmont, July 18.

1107. *Smilacina stellata* (L.) Desf. Common false Solomon's seal. Wooded banks of streams in eastern Nebraska, common. Lincoln; Crete; Weeping Water.

409. POLYGONATUM Adans. Solomon's seal.

1108. *Polygonatum commutatum*.(Schult.) Dietr. (*P. giganteum* Dietr.) Woods, common. Lincoln; Weeping Water; Crete.

410. ASPARAGUS L. Asparagus.

1109. *Asparagus* OFFICINALIS L. Garden asparagus. Escaped to waste places and banks of streams. Lincoln.

411. SMILAX L. Greenbrier; catbrier.

1110-11. *Smilax herbacea* L. Carrion flower. In woods along river banks, common. Milford; Lincoln; Peru; Tecumseh; Wymore; Weeping Water.

1112. *Smilax hispida* Muhl. Greenbrier. Wooded banks of streams, common. Lincoln; Tecumseh; Brownville; Crete; Weeping Water.

## 86. AMARYLLIDACEÆ. (AMARYLLIS FAMILY.)

412. HYPOXYS L. Star grass.

1113. *Hypoxys erecta* L. Star grass. Meadows, etc., June. Otoe county.

## 87. IRIDACEÆ. (IRIS FAMILY.)

413. SISYRINCHIUM L. Blue-eyed grass.

1114. *Sisyrinchium mucronatum* Michx. (*S. bermudiana* var. *mucronatum* Gray.) Low grounds, common. May, June. Lincoln; Crete; Weeping Water.

## 88. ORCHIDACEÆ. (ORCHIS FAMILY.)

414. CYPRIPEDIUM L. Lady's slipper; moccasin flower.

1115. *Cypripedium candidum* Muhl. Small white lady's slipper. Antelope county; Knox county, June.

1116. *Cypripedium pubescens* Willd. Larger yellow lady's slipper, or moccasin flower. Peru, May; Belmont (?), July 24.

415. HABENARIA Willd. Rein orchis.

1117. *Habenaria leucophæa* (Nutt.) Gray. Greenish fringed orchis. Low wet prairies, not uncommon. July. Lincoln.

416. ORCHIS L.

1118. *Orchis spectabilis* L. Showy orchis. Rich woods, May. Plattsmouth; Peru; Antelope county.

417. SPIRANTHES L. Ladies' tresses.

1119. *Spiranthes romanzoffiana* Cham. Wet prairies and canons; common in the western part of the state. Thedford, July 11; Belmont, July 18; Hat Creek basin, in Sioux county, August 1.

## *Sub-Class II.—Dicotyledones.*

## 89. CUPULIFERÆ. (OAK FAMILY.)

418. QUERCUS L. Oak.

1120. *Quercus alba* L. White oak. Weeping Water. W.

1121. *Quercus coccinea* Wang. Scarlet oak. Eastern part of the state; bluffs of the Missouri river. Richardson county, August 26; Peru, May.

1122. *Quercus ilicifolia* Wang. Bear, or black scrub oak. Weeping Water. W.

1123. *Quercus imbricaria* Michx. Laurel, or shingle oak. East Nebraska. (Gray's Manual, p. 478.)

1124. *Quercus macrocarpa* Michx. Bur oak; over-cup or mossy-cup. Rich soil along streams; very common in the eastern part of the state. Richardson county; Antelope county; Lincoln; Wymore; Weeping Water; Peru; Crete; Long Pine.

1125. *Quercus muhlenbergii* Engelm. Yellow oak; chestnut oak. East Nebraska. (Gray's Manual, p. 476.)

1126. *Quercus nigra* L. Black jack, or barren oak. East Nebraska. (Gray's Manual, p. 478.)

1127. *Quercus prinoides* Willd. (*Q. prinus* var. *humilis* Marsh.) A small bush about three feet high. Bluffs of Missouri river; Richardson county, August 15.

1128 *Quercus rubra* L. Red oak. Weeping Water. W.

1129. *Quercus stellata* Wang. (*Q. obtusiloba* Michx.) Post oak, or iron oak. East Nebraska. (Gray's Manual, p. 475.)

419. CORYLUS L. Hazelnut.

1130. *Corylus americana* Walt. Common in the eastern part of the state. Wymore; Weeping Water; Peru; Omaha; Richardson county.

420. OSTRYA Scop.

1131. *Ostrya virginiana* (Mill.) B. S. P. (*O. virginica* Willd.) Hop-hornbean; iron-wood. Long Pine. B.

421. ALNUS Gærtn. Alder.

1132. *Alnus incana ?* Willd. Speckled, or hoary alder. East Nebraska. (Gray's Manual, p. 473.)

422. BETULA L. Birch.

1133. *Betula nigra* L. River, or red birch. Banks of Missouri river; Plattsmouth. W.

1134. *Betula occidentalis* Hook. Black birch. In canons; common in the extreme northwestern part of the state. Hat Creek basin, in Sioux county, August 1. A shrub or small tree from eight to sixteen feet high.

### 90. JUGLANDACEÆ. (WALNUT FAMILY.)

423. JUGLANS L.

1135. *Juglans cinerea* L. Butternut; white walnut. River banks; rare. Wymore; Weeping Water; Nebraska City.

1136. *Juglans nigra* L. Black walnut. Rich soil, river banks; common. June. Lincoln; Wymore; Weeping Water; Long Pine.

424. HICORIA Raf. Hickory trees.

1137. *Hicoria alba ?* (L.) Britton. (*Carya tomentosa* Nutt.) East Nebraska. (Gray's Manual, p. 469.)

1138. *Hicoria minima* (Marsh.) Britton. (*Carya amara* Nutt.) Bitter-nut, or swamp hickory. River banks; common in eastern Nebraska along the Missouri river. Peru; Lincoln; Weeping Water.

1139. *Hicoria ovata* (Mill.) Britton. (*Carya alba* Nutt.) Shell-bark, or shag-bark hickory. River banks; not uncommon. Wymore; Peru; Plattsmouth; Richardson county.

1140. *Hicoria glabra* (Mill.) Britton. (*Carya porcina* Nutt.) Pig-nut, or broom hickory. Weeping Water. W.

### 91. SALICACEÆ. (WILLOW FAMILY.)

425. POPULUS L. Poplar; aspen.

1141. *Populus angustifolia* James. Black cottonwood. Canons. Hat Creek basin, Sioux county, August 2, 1889. The streets of Fort Robinson, in Dawes county, are lined with trees of this species, transplanted from this region.

1142. *Populus balsamifera* L. var. *candicans* Gray. Balsam poplar, or Tacamahac. Wooded valleys and canons. Hat Creek basin, in Sioux county, August 2, 1889.

1143. *Populus monilifera* Ait. (Includes *P. angulata* Ait.) Cottonwood; necklace poplar. Very common along streams, etc., all over the state. Lincoln; Weeping Water; Peru; Omaha; Tecumseh; Anselmo; Thedford; Broken Bow; Belmont; Hat Creek basin.

1144. *Populus tremuloides* Michx. American aspen. Rich soil. Brownville, on Missouri river valley, and Hat Creek basin in Sioux county.

426. SALIX L. Willow; osier.

1145. *Salix cordata* Muhl. var. *vestita* Anders. Diamond willow; heart-leaved willow. Banks of streams, common. Peru; Long Pine; Belmont; Hat Creek basin, in Sioux county.

1146. *Salix humilis* Marshall. Prairie willow. Prairies; common. Cass county; Richardson county; Lincoln; Long Pine; Anselmo.

1147. *Salix amygdaloides* Anders. Fort Robinson; Long Pine; Crete. B.

1148. *Salix lucida* Muhl. Shining willow. Weeping Water.

1149. *Salix longifolia* Muhl. Long-leaved willow. Low places, banks of streams, etc., common. Lincoln; Crete; Milford; Peru; Weeping Water; Pierce; Anselmo.

1150. *Salix nigra* Marshall. Black willow. River banks, etc.; very common, especially in the eastern part of the state. Peru; Lincoln; Fairbury; Weeping Water.

## 92. URTICACEÆ. (NETTLE FAMILY.)

427. **PARIETARIA** L. Pellitory.

1151. *Parietaria pennsylvanica* Muhl. Pellitory. Damp woods, common. July. Lincoln; Weeping Water; Belmont, July 21.

428. **PILEA** Lindl.

1152. *Pilea pumila* (L.) Gray. Richweed; clearweed. Cold, damp woods, common. August. Lincoln; Weeping Water.

429. **LAPORTEA** Gaudich. Wood-nettle.

1153. *Laportea canadensis* (L.) Gaudich. Wood-nettle. Damp woods, common. Lincoln; Weeping Water.

430. **URTICA** L. Nettle.

1154. *Urtica gracilis* Ait. Common nettle. Fence rows, moist places, etc., common. July–September. Lincoln; Long Pine; Weeping Water; Omaha.

1155. *Urtica dioica* L. Introduced. Weeping Water. W.

431. **MORUS** L. Mulberry.

1156. *Morus rubra* L. Red mulberry. Along streams in the eastern part of the state. B.

1157. *Morus* ALBA L. White mulberry. Introduced. Weeping Water. W.

432. **CANNABIS** L. Hemp.

1158. *Cannabis* SATIVA L. Common hemp. Waste grounds, common. Introduced. Lincoln; Howard county; Antelope county; Weeping Water; Belmont.

434. **HUMULUS** L. Hop.

1159. *Humulus lupulus* L. Common hop. Woods, not uncommon. Lincoln; Valentine; Weeping Water; Belmont; and Richardson county.

435. **CELTIS** L. Hackberry.

1160. *Celtis occidentalis* L. Hackberry; sugar-berry. Banks of streams, canons, etc., common. Peru; Weeping Water; Anselmo; Dismal river, in Thomas county; Belmont; and Hat Creek basin, in Sioux county.

436. **ULMUS** L. Elm.

1161. *Ulmus americana* L. American, or white elm. Banks of creeks, canons, etc., common. Lincoln; Weeping Water; Crete; Peru; Richardson county; Belmont; Hat Creek basin, in Sioux county.

1162. *Ulmus fulva* Michx. Slippery, or red elm. Rich soil, river banks; not uncommon. Plattsmouth; Wymore; Weeping Water; Peru; Richardson county.

## 93. PLATANACEÆ. (PLANE-TREE FAMILY.)

437. **PLATANUS** L. Button-wood; plane tree.

1163. *Platanus occidentalis* L. American plane; sycamore. On the banks of the Missouri river. Here quite common, but not occurring in the central and western regions of the state. Peru; Brownville; and Richardson county.

## 93½. POLYGONACEÆ. (BUCKWHEAT FAMILY.)

438. **RUMEX** L. Dock; sorrel.

1164. *Rumex* ACETOSELLA L. Field, or sheep sorrel. Waste places; becoming common. Introduced. May. Lincoln; Wymore.

1165. *Rumex altissimus* Wood. (*R. britannica* Gray, not L.) Pale dock. Waste places; common. June–August. Lincoln; Weeping Water.

1166. *Rumex* CRISPUS L. Curled dock. Waste places; common. Introduced. July. Lincoln.

1167. *Rumex maritimus* L. Golden dock. Low, wet grounds. Crawford, July 29.

1168. *Rumex salicifolius* Weinmann. White dock. Waste places. Lincoln; Crete.

1169. *Rumex venosus* Pursh. Winged dock. Usually on sandy prairies. Cherry county; Antelope county; Cheyenne county; Fairfield; Thedford; Belmont.

439. FAGOPYRUM Gærtn. Buckwheat.

1170. *Fagopyrum* ESCULENTUM Mœnch. Common cultivated buckwheat. Escaped to roadsides and waste places. Lincoln; Weeping Water.

440. POLYGONUM L. Knotweed.

1171. *Polygonum acre* H. B. K. Water smartweed. Roadsides, etc. Weeping Water. W.

1172. *Polygonum amphibium* L. Water persicaria. In edge of water. Weeping Water, and Richardson county, August 25.

1173. *Polygonum* AVICULARE L. Knot-grass; door-weed; goose-grass. House yards and roadsides; very common. Introduced. Lincoln; Crete; Weeping Water; Anselmo.

1174. *Polygonum* CONVOLVULUS L. Black bindweed. Waste places; common. Introduced. Lincoln; Fairbury; Saunders county; Anselmo, July 6; Thedford, July 11.

1175. *Polygonum dumetorum* L. var. *scandens* (L.) Gray. Climbing false buckwheat. Roadsides and waste places; common. Lincoln; Weeping Water.

1176. *Polygonum erectum* L. (*P. aviculare* L. var. *erectum* Roth.) Knot-grass; door-weed. Roadsides and yards; not uncommon. Fort Robinson; Lincoln; Weeping Water.

1177. *Polygonum hartwrightia* Gray. Persicaria. In edges of ponds; not very common. Thedford, August 7.

1178. *Polygonum hydropiper* L. Common smartweed or water pepper. Wet places; common. July. Lincoln; Weeping Water.

1179. *Polygonum incarnatum* Ell. Smartweed. Edges of ponds; not uncommon. Lincoln; Weeping Water; Belmont, July 25. In my Lincoln specimens, clearly referable to this species, I find many flowers that have the perianth four-parted instead of five-parted. *P. incarnatum* comes under the sub-genus *Persicaria*, of which "perianth five-parted" is made a principal character in all manuals so far as I know.

1180. *Polygonum persicaria* L. Lady's thumb. Waste places; common. July. Lincoln; Weeping Water.

1181. *Polygonum pennsylvanicum* L. Smartweed. Waste places; common. Crete; Weeping Water; Lincoln.

1182. *Polygonum ramosissimum* Michx. Knotweed. Waste places, very common. July. Lincoln; Crete; Weeping Water; Polk county.

1183. *Polygonum sagittatum* L. Arrow-leaved tear thumb. Long Pine. B.

1184. *Polygonum tenue* Michx. Slender knotgrass. Barren waste lands; not uncommon. Lincoln; Weeping Water; Anselmo, July 6.

1185. *Polygonum terrestre* (Willd.) B. S. P. (*P. amphibium* L. var. *terrestre* Willd.) Water persicaria. Waste places, fields, etc. Peru; Lincoln; Weeping Water; Kennedy. July and August.

1186. *Polygonum virginianum* L. Persicaria. Thickets; common in the eastern part of the state. Lincoln, August; Richardson county, August 25.

441. ERIOGONUM Michx.

1187. *Eriogonum alatum* Michx. Nebraska. (Watson, Pro. Am. Acad., vol. VII, p. 254, and Coulter's Manual.)

1188. *Eriogonum annuum* Nutt. Prairies; very common from central Nebraska westward. Antelope county; Valentine; Ewing; Dismal river in Thomas county, July 13; Anselmo, July 6; Hat Creek basin in Sioux county, August 1; Belmont, July 27; Court House rock, Cheyenne county.

1189. *Eriogonum flavum* Nutt. Rocky ridges. Belmont, July 25; Hat Creek basin in Sioux county, August 2; Court House rock, Cheyenne county.

1190. *Eriogonum multiceps* Nees. Hat Creek basin, Sioux county, August 2. In dry valleys, spreading up the hills; quite commonly associated with Artemisia. A few specimens have the involucre six-toothed instead of five, and the flowers greenish white. Very similar to *E. pauciflorum* Nutt., from which it is distinguished by being densely white tomentose throughout; by its pinkish pubescent flowers; and rigid, narrowly turbinate, tomentose, very short and narrow five-toothed involucre.

## 94. CHENOPODIACEÆ. (GOOSEFOOT FAMILY.)

442. SUÆDA Forskal. Sea blite.

1191. *Suæda linearis* (Ell.) Torr. var. *salsa* (Michx.) B. S. P. (*S. maritima* of Gray.) Low, alkaline lands, banks of ponds, etc., common. Lincoln; Alliance.

443. SALSOLA L. Saltwort.

1192. *Salsola kali* L. Common saltwort. River bottoms. Cherry county. (Bates.) U.

444. SARCOBATUS Nees. Greasewood.

1193. *Sarcobatus vermiculatus* Torr. Greasewood. Bad-lands, rare. Hat Creek basin, Sioux county, August 1. A spinescent shrub, 1½–2 feet high, with a smooth, white bark.

445. SALICORNIA L. Glasswort; samphire.

1194. *Salicornia herbacea* L. Glasswort; samphire. Salt basin, common. Lincoln.

446. CORISPERMUM A. Jussieu. Bug-seed.

1195. *Corispermum hyssopifolium* L. Waste, sandy places, etc., common. Lincoln; Weeping Water; Crawford, July 29; Hat Creek basin, in Sioux county, August 2; Dismal river, in Thomas county, July 12.

447. ATRIPLEX L. Orache.

1196. *Atriplex patula* L. var. *hastata* (L.) Gray. Barren saline lands, common. Lincoln; Alliance.

1197. *Atriplex nuttallii* Watson. More or less alkaline lands; not so common as the preceding. September. Lincoln.

448. CHENOPODIUM L. Pigweed; goosefoot.

1198. *Chenopodium* ALBUM L. Lamb's quarters; pigweed. Waste places everywhere. Lincoln; Weeping Water; Hastings; Peru; Anselmo; Broken Bow; Thedford; Belmont. (Nat. from Europe.)

1199. *Chenopodium* HYBRIDUM L. Maple-leaved goosefoot. Shady places, common. Lincoln; Crete; Weeping Water. (Nat. from Europe.)

449. CYCLOLOMA Moquin. Winged pigweed.

1200. *Cycloloma platyphyllum* Moquin. Waste places, sandy banks, etc., not uncommon. July–September. Lincoln; Long Pine; Louisville;

Weeping Water; Antelope county. When old, this frequently assumes a reddish-purple color.

### 95. AMARANTACEÆ. (AMARANTH FAMILY.)

450. FRŒLICHIA Moench.

1201. *Frœlichia floridana* Moquin. Prairies, usually sandy, common. Antelope county; Valley Junction; Long Pine; Anselmo, July 1; Dismal river, in Thomas county, July 13.

451. ACNIDA L. Water hemp.

1202. *Acnida tuberculata* Moq. (*Montelia tamariscina* Gray in part.) Waste places; a common weed. Lincoln; Crete; Tecumseh; Weeping Water.

452. AMARANTUS L. Amaranth.

1203. *Amarantus albus* L. Tumble weed. Lincoln; Weeping Water. W.

1204. *Amarantus blitoides* Watson. Prairies and waste places; common. Lincoln; Crete; Hastings; Weeping Water.

1205. *Amarantus retroflexus* L. Pigweed; green amaranth. Waste places; a troublesome weed. Lincoln; Crete; Long Pine; Weeping Water; Tecumseh.

### 96. PHYTOLACCACEÆ. (POKEWEED FAMILY.)

453. PYTOLACCA L.

1206. *Phytolacca decandra* L. Common poke, or scoke weed; garget; pigeon berry. Roadsides. Missouri river valley; Richardson county, August 26.

### 97. NYCTAGINACEÆ. (FOUR-O'CLOCK FAMILY.)

454. ABRONIA Juss.

1207. *Abronia fragans* Nutt. Prairies; common. Alliance, August 7; Belmont, July 25; Cheyenne county.

455. OXYBAPHUS Vahl.

1208. *Oxybaphus angustifolius* Sweet. Prairies and waste places; common. June–July. Lincoln; Weeping Water; Arapahoe; Crete; Fairbury; Hastings; Long Pine; Alliance.

1209. *Oxybaphus hirsutus* Sweet. Prairies; not uncommon. June and July. Lincoln; Fort Robinson; Long Pine; Anselmo.

1210. *Oxybaphus nyctagineus* Sweet. Roadsides and yards, common. May and June. Lincoln; Crete; Weeping Water; Fairbury.

1211. *Oxybaphus nyctagineus* Sweet, var. *oblongifolius* Gray. Roadsides, common. July. Lincoln; Seward county.

### 97½. CARYOPHYLLACEÆ. (PINK FAMILY.)

(Including *Illecebraceæ.*)

456. ARENARIA L. Sandwort.

1212. *Arenaria lateriflora* L. Long Pine, May. U.

1213. *Arenaria pungens* Nutt. High prairies and rocky barren hills, common. Fort Robinson; Gordon; Belmont, July 13.

457. CERASTIUM L. Mouse-ear chickweed.

1214. *Cerastium nutans* Raf. Mouse-ear chickweed. Low prairies; rare. May. Lincoln.

458. SILENE L. Catchfly; campion.

1215. *Silene antirrhina* L. Sleepy catchfly. Prairies and waste places; common. May–June. Lincoln; Fairbury; Crete; Weeping Water; Belmont; Dismal river in Thomas county.

1216. *Silene* NOCTIFLORA L. Night-flowering catchfly. Waste places; rather uncommon. Introduced. June. Lincoln.

1217. *Silene stellata* (L.) Ait. Starry campion. Wooded banks; quite common in the eastern part of the state. July. Lincoln; Crete; Weeping Water; Richardson county.

459. SAPONARIA L.

1218. *Saponaria* OFFICINALIS L. Soap-wort; bouncing Bet. Escaped to roadsides. Richardson county, August 25.

460. PARONYCHIA Tourn.

1219. *Paronychia jamesii* Torr. & Gr. High prairies. Sioux county, July 30; Fort Robinson, May.

### 98. PORTULACEÆ. (PURSLANE FAMILY.)

461. CLAYTONIA L. Spring beauty.

1220. *Claytonia virginica* L. Narrow-leaved spring beauty. In damp woods; on the bluffs of the Missouri river. Probably limited to the eastern region. Omaha, April.

462. TALINUM Adans.

1221. *Talinum teretifolium* Pursh. Sand hills, etc. July–August. Dawes county; Long Pine.

463. PORTULACA L. Purslane.

1222. *Portulaca* OLERACEA L. Common purslane. Gardens, waste places, etc.; common. July. Lincoln; Weeping Water. (Nat. from Europe.)

### 99. BERBERIDACEÆ. (BARBERRY FAMILY.)

464 PODOPHYLLUM L. May apple; mandrake.

1223. *Podophyllum peltatum* L. Common May apple, or mandrake. Richardson county; Brownville.

465. BERBERIS L. Barberry.

1224. *Berberis repens* Lindl. Rocky places, canons, etc. A low shrub (15–35 cm. high); common in northwestern Nebraska; Belmont, July 24; Hat Creek basin in Sioux county, August 1.

### 100. MENISPERMACEÆ. (MOONSEED FAMILY.)

466. MENISPERMUM L. Moonseed.

1225. *Menispermum canadense* L. Canadian moonseed. Wooded banks; common; climbing over shrubs, etc. June–July. Fairbury; Peru; Crete; Lincoln; Weeping Water.

### 101. ANONACEÆ, (CUSTARD-APPLE FAMILY.)

467. ASIMINA Adans. North American papaw.

1226. *Asimina triloba* (L.) Dunal. Common papaw. Rich soil; common in southeastern Nebraska along the Missouri river. Richardson county; Peru; Nebraska City.

### 102. RANUNCULACEÆ. (CROWFOOT FAMILY.)

468. ACTÆA L. Baneberry; cohosh.

1227. *Actæa spicata* L. var. *rubra* Ait. Red baneberry. In damp wooded canons. Hat Creek basin, August 2; Belmont, July 25. With bright shiny red, oval or elliptical berries.

469. DELPHINIUM L. Larkspur.

1228. *Delphinium azureum* Michx. Azure larkspur. Common on low prairies. Flowers whitish. June and July. Lincoln; Fairbury; Peru; Weeping Water; Crete; Dismal river in Thomas county.

1229. *Delphinium exaltatum* Ait. Tall larkspur. In open woods and low prairies, common in the eastern part of the state. May–July. Weeping Water; Peru; Saltillo, and Otoe county.

470. AQUILEGIA L. Columbine.

1230. *Aquilegia canadensis* L. Wild Columbine. Rocky banks in woods, in shaded canons, etc.; common. May–July. Richardson county; Wymore; Weeping Water; Peru; Fremont; Belmont.

471. MYOSURUS Dill. Mouse-tail.

1231. *Myosurus minimus* L. Little mouse-tail. Low, wet grounds, common. May. Lincoln; Weeping Water.

472. RANUNCULUS L. Crowfoot; buttercup.

1232. *Ranunculus abortivus* L. Small flowered crowfoot. In or near woods in wet places, common. May–June. Lincoln; Weeping Water; Peru; Crete.

1233. *Ranunculus* ACRIS L. Tall crowfoot. Buttercups. Spreading into the eastern part of the state. Peru.

1234. *Ranunculus aquatilis* L. var. *trichophyllus* Gray. Common white water-crowfoot. In streams, very abundant. Long Pine; Weeping Water; Lincoln; Anselmo; Thedford; Belmont.

1235. *Ranunculus cymbalaria* Pursh. Sea-side crowfoot. Marshy grounds, edges of streams, etc., common. Antelope county; Columbus; Broken Bow, July 4; Crawford, July 29; Alliance, August 6. In places it forms dense patches from 7–10 centimetres high. Its long rooting runners spread out in all directions and touching here and there send up clusters of leaves and stems, crowding their way through the surrounding vegetation.

1236. *Ranunculus romboideus* Goldie. Sea-side crowfoot. Low, wet grounds. April and June. Antelope county; Long Pine.

1237. *Ranunculus multifidus* Pursh. Yellow water crowfoot. In water, not common. Valentine; Crete. U.

1238. *Ranunculus nuttallii* Gray. Crowfoot. Low, wet grounds. Antelope county.

1239. *Ranunculus pennsylvanicus* L. In ravines, rare. Belmont. Dawes county, July 21. Altitude 4,600 feet.

1240. *Ranunculus recurvatus* Poir. Hooked crowfoot. Weeping Water. W.

1241. *Ranunculus sceleratus* L. Cursed crowfoot. In edges of water, rare. Belmont, July 18. From 15-25 centimetres high. Low specimens leafy.

473. ADONIS L. Pheasant's eye.

1242. *Adonis* AUTUMNALIS L. Escaped from cultivation. Lincoln. P.

474. ANEMONE L. Wind flower.

1243. *Anemone decapetala* L. (*A. caroliniana* of Gray's Manual.) Anemone. Common on prairie. May–June. Lincoln; Fairbury; Peru; Crete; West Point; Weeping Water; Harlan county; Hitchcock county.

1244. *Anemone cylindrica* Gray. Long fruited anemone. Prairies, common. June–July. Lincoln; Weeping Water; Crete; Anselmo, July 26; Belmont, July 24; Broken Bow, July 4. A form is quite commonly found having the peduncles *with an involucre* as in *A. dichotoma*, instead of naked. It may be a hybrid with *A. dichotoma*, but this species is not known to occur in all the places where the peculiarity has been observed. Lincoln; Broken Bow, July 4; Belmont, July 24.

1245. *Anemone dichotoma* L. (*A. pennsylvanica* L. of Gray's Manual.) Prairies, common in eastern Nebraska. May–July. Lincoln; Weeping Water; Nebraska City; Peru.

1246. *Anemone nemorosa* L. Wood anemone; wind flower. In woods, rare. Greenwood. P.

1247. *Anemone patens* L. var. *nuttalliana* Gray. Pasque flower. Prairies, common in north and northwestern Nebraska. Fort Robinson; West Point; Antelope county.

1248. *Anemone virginiana* L. Virginian anemone. Weeping Water. W.

1249. *Anemone multifida* Poir. Cut-leaved anemone. At base of high bluff in a ravine, rare. Belmont, Dawes county, July 24, 1889 (in fruit). My specimens differ somewhat from the usual form. The majority of them bear two peduncles, one of which has a two-leaved involucel somewhat below the middle; but quite a number have but a single naked peduncle. All of the leaves are usually twice or thrice three-parted or divided into linear divisions. The root leaves are long petioled (6–20 centimetres), those of the involucre short petioled, those of the involucels sessile or sub-sessile. The one-peduncled form is mentioned in Walpers' Repertorium, vol. I, p. 28, "*rarius abortu?* 1." I should not, from my specimens, take it to be an abortive form, as the one-peduncled specimens are among the largest and apparently most thrifty specimens of the lot.

**475.** ANEMONELLA Spach.

1250. *Anemonella thalictroides* (L.) Spach. (*Thalictrum anemonoides* Michx.) Rue-anemone. Woods, rare. Woodlawn. April. P.

**476.** THALICTRUM L. Meadow-rue.

1251. *Thalictrum purpurascens* L. Tall meadow-rue. Banks of streams; common. July–September. Lincoln; Peru; Crete; Weeping Water; Anselmo; Belmont.

**477.** CLEMATIS L. Virgin's bower.

1252. *Clematis ligusticifolia* Nutt. Virgin's bower. Climbing over bushes; very common. Long Pine; Fort Robinson; Dismal river in Thomas county, July 13; Belmont, July 18. A very beautiful climber, similar to *C. virginiana*, from which it is easily distinguished by its five-foliate leaves.

1253. *Clematis pitcheri* Torr. & Gray. Leather flower. River banks. Rare. June. Otoe county.

1254. *Clematis virginiana* L. Common virgin's bower. Not uncommon in the eastern part of the state. July. Lincoln; Peru; Weeping Water.

### 103. NYMPHÆACEÆ. (WATER LILY FAMILY.)

**478.** CASTALIA Salisb. (*Nymphæa* in part.) Water lily.

1255. *Castalia tuberosa* (Paine) Greene. (*Nymphæa tuberosa* Paine.) White water lily. In ponds, rare. Lincoln.

**479.** NYMPHÆA (L.) Salisb. (*Nuphar* Smith.)

1256. *Nymphæa advena* Soland. (*Nuphar advena* Ait.) Yellow pond lily. In ponds, rare. Weeping Water. W.

**480.** NELUMBO Tourn.

1257. *Nelumbo lutea* Pers. East Nebraska. (Gray's Manual, p. 55.)

## 104. PAPAVERACEÆ. (POPPY FAMILY.)

481. ARGEMONE L. Prickly poppy.

1258. *Argemone platyceras* Link & Otto. Prickly poppy. Prairies; very common. Long Pine; Thedford, August 7; Belmont, July 24; Anselmo, July 8. Flower very large and showy; white.

## 105. FUMARIACEÆ. (FUMITORY FAMILY.)

482. CORYDALIS DC.

1259. *Corydalis aurea* (Michx.) Willd. var. *occidentalis* Gr. Golden corydalis. Waste places; common. May–June. Lincoln; Fairbury; Belmont.

1260. *Corydalis aurea* (Michx.) Willd. var. *micrantha* Engelm. Golden corydalis. Somewhat rare. Peru.

1261. *Corydalis curvisiliqua* (Gray) Engelm. Golden corydalis. Waste places. Peru.

483. DICENTRA Borkh. Dutchman's breeches.

1262. *Dicentra cucullaria* (L.) DC. Dutchman's breeches. Rich woods, common in the eastern part of the state. May. Weeping Water; Peru; Wymore.

1263. *Dicentra canadensis* (Goldie.) DC. Squirrel corn. Woods, rare. Weeping Water. W.

## 106. CRUCIFERÆ. (MUSTARD FAMILY.)

484. LEPIDIUM Tourn. Pepperwort; peppergrass.

1264. *Lepidium intermedium* Gray. Wild peppergrass. Waste places, very common. Lincoln; Weeping Water.

1265. *Lepidium virginicum* L. Wild peppergrass. Common in waste places. Lincoln; Weeping Water; Peru.

485. CAPSELLA Mœnch.

1266. *Capsella* BURSA-PASTORIS (L.) Mœnch. Shepherd's purse. Everywhere in eastern Nebraska; a troublesome weed. April–September. Lincoln; Crete; Fairbury; Peru; Weeping Water.

486. BRASSICA L. Mustard.

1267. *Brassica* ALBA (L.) Gray. White mustard. Weeping Water. W. Introduced.

1268. *Brassica* ARVENSIS (L.) B. S. P. (*B. sinapistrum* Boiss.) Charlock. Waste places. Introduced. June. Lincoln; Peru; Crete; Long Pine, and Douglas county.

1269. *Brassica* NIGRA (L.) Koch. Black mustard. Introduced. W.

487. CAMELINA Crantz.

1270. *Camelina* SATIVA (L.) Crantz. False flax. Escaped to waste places. Crete; Weeping Water; Lincoln; Belmont; Broken Bow.

488. ERYSIMUM L. Treacle mustard.

1271. *Erysimum asperum* DC. var. *arkansanum* Gray. Western wall-flower. Prairies, common. Antelope county; Valentine; Belmont.

1272. *Erysimum cheiranthoides* L. Worm-seed mustard. Wooded banks of streams. July. Lincoln; Crete; Belmont; Anselmo; Dismal river in Thomas county.

489. SISYMBRIUM L. Hedge mustard.

1273. *Sisymbrium incisum* Engelm. Weeping Water, May. P.

1274. *Sisymbrium officinale* (L.) Scop. Hedge mustard. Waste places, common. June. Nebraska City; Lincoln.

1275. *Sisymbrium pinnatum* (Walt.) Greene. (*S. canescens* Nutt.) Tansy mustard. Roadsides, etc., common. May. Lincoln; Weeping Water.

490. DRABA L. Whitlow grass.

1276. *Draba caroliniana* Walt. Common in low places. March–June. Lincoln; Fairbury; Sydney; Valentine; Weeping Water.

1277. *Draba carolinana* Walt. var. *micrantha* (Nutt.) Gray. Weeping Water. W.

491. LESQUERELLA Watson. (*Vesicaria* of Am. manuals.)

1278. *Lesquerella alpina* (Nutt.) Watson. High rocky prairies and banks, common. Belmont, July 18.

1279. *Lesquerella ludoviciana* (DC.) Watson. High prairies, common. Belmont, July 25; Valentine, May 20. A beautiful species with pendulous pods. A form of this, found at Belmont, July 21, 1889, is more slender, has divergent upward curved pedicels, and longer styles.

492. ARABIS L. Rock cress.

1280. *Arabis canadensis* L. Sickle-pod. In woods, common. Nebraska City, June 2.

1281. *Arabis confinis* S. Watson. (*A. drummondii* Man.) Tower mustard. Crete, July 4.

1282. *Arabis hirsuta* (L.) Scop. Rock cress. Lincoln. P.

493. NASTURTIUM R. Br. Water cress.

1283. *Nasturtium* ARMORACIA (L.) Fries. Common horseradish. Escaped in places. Lincoln.

1284. *Nasturtium* OFFICINALE R. Br. True water cress. Escaped. Douglas county. U.

1285. *Nasturtium palustre* (L ) DC. Marsh cress. Lowlands. Lincoln; Fairbury.

1286. *Nasturtium palustre* (L.) DC. var. *hispidum* (Desv.) Fisch & Meyer. Wet places. Lincoln.

## 107. CAPPARIDACEÆ. (CAPER FAMILY.)

494. POLANISIA Raf.

1287. *Polanisia dodecandra* (Michx.) B. S. P. (*P. graveolens* Raf.) Dry, open, sandy, and stony places; common in the western part of the state. July. Long Pine; Belmont, and Cheyenne county.

1288. *Polanisia trachysperma* Torr. & Gr. Sand hills. Thedford, August 7. Like the last this frequents dry sandy places.

495. CLEOME L. Cleome.

1289. *Cleome integrifolia* Torr. & Gr. Cleome. Roadsides, etc., common. June–July. Lincoln; Nebraska City (very common); Long Pine; Weeping Water; Thedford; Belmont.

1290. *Cleome lutea* Hook. Cleome. Weeping Water. W.

496. CLEOMELLA DC.

1291. *Cleomella angustifolia* Torr. Dry, rocky places. Camp Clark, Cheyenne county, August 24.

## 108. RESEDACEÆ. (MIGNONETTE FAMILY.)

497. RESEDA L. Mignonette; Dyer's rocket.

1292. *Reseda* LUTEOLA L. Dyer's weed or weld. Escaped from cultivation. Weeping Water. W.

## 109. VIOLACEÆ. (VIOLET FAMILY.)

498. VIOLA L. Violet; heart's-ease.

1293. *Viola canadensis* L. Canada violet. Wooded canons, not common. Belmont, July 18.

1294. *Viola delphinifolia* Nutt. Larkspur violet. Prairies, common. May–July. Lincoln; Fairbury; Peru; Weeping Water.

1295. *Viola nuttallii* Pursh. Yellow prairie violet. Dry prairies. April–May. Valentine.

1296. *Viola palmata* L. Hand-leaf violet. May. Peru.

1297. *Viola palmata* L. var. *cucullata* (Ait.) Gray. (*Viola cucullata* Ait.) Common blue violet. Woods and low grounds; banks of streams, very common. April–June. Lincoln; Fairbury; Weeping Water; Peru; Crete; Long Pine.

1298. *Viola pubescens* Ait. var. *scabriuscula* Torr. & Gr. Downy yellow violet. Common in the woods of eastern Nebraska. May. Roca; Peru; Crete; Weeping Water.

### 110. CISTACEÆ. (ROCK-ROSE FAMILY.)

499. HELIANTHEMUM Pers. Rock-rose.

1299. *Helianthemum majus* (L.) B. S. P. (*H. canadense* Michx.) Frost-weed. Louisville. W.

### 111. HYPERICACEÆ. (ST. JOHN'S-WORT FAMILY.)

500. HYPERICUM L. St. John's-wort.

1300. *Hypericum perforatum* L. Common St. John's-wort. Waste places, fields, etc. June. Lincoln.

501. ASCYRUM L. St. Peter's-wort.

1301. *Ascyrum crux-andreæ* L. St. Andrew's cross. Nebraska. Gray's Manual, p. 92.)

### 112. ELATINACEÆ. (WATERWORT FAMILY.)

502. ELATINE L. Waterwort.

1302. *Elatine triandra* Schkuhr. Nebraska. (Coulter's Manual, and Gray's Manual, p. 92.)

### 113. TILIACEÆ. (LINDEN FAMILY.)

503. TILIA L. Linden; basswood.

1303. *Tilia americana* L. Basswood. Rich soil, common in eastern Nebraska. Wymore; Peru; Long Pine; Omaha; and Richardson county.

### 114. MALVACEÆ. (MALLOW FAMILY.)

504. HIBISCUS L. Rose-mallow.

1304. *Hibiscus militaris* Cav. Halberd-leaved rose-mallow. Wet places. Ashland, July 15. W.

1305. *Hibiscus* TRIONUM L. Bladder Ketmia. Roadsides, etc.; abundant. August–October. Dakota county; Roca. (Adv. from Europe.)

505. ABUTILON Gærtn. Indian mallow.

1306. *Abutilon* AVICENNÆ Gærtn. Velvet-leaf; button-weed; butter-weed. Waste places; too common. August. Lincoln; Weeping Water; Peru. (Adv. from India.)

506. SIDA L.

1307. *Sida* SPINOSA L. Waste places, roadsides, etc. Nemaha county, August 28.

507. MALVASTRUM Gray. False mallow.

1308. *Malvastrum coccineum* Gray. False mallow. Prairies; common. July–August. Antelope county; Hitchcock county; Fort Kearney; Fort Robinson; Broken Bow; Belmont; Thedford.

508. MALVA L. Mallow.

1309. *Malva* ROTUNDIFOLIA L. Common mallow. Yards, etc.; becoming common. Lincoln. Introduced.

1310. *Malva* SYLVESTRIS L. High mallow. Cass county. U.

509. CALLIRRHOE Nutt.

1311. *Callirrhoe alcæoides* Gray. Prairies and waste places; common. May. Lincoln; Fairbury; Weeping Water; Peru; Crete.

1312. *Callirrhoe involucrata* Gray. Prairies. July. Nelson; Hastings; Cambridge.

### 115. GERANIACEÆ. (GERANIUM FAMILY.)

510. IMPATIENS L. Balsam; jewel-weed.

1313. *Impatiens aurea* Muhl. (*I. pallida* Nutt.) Pale touch-me-not. Damp, shady places; common. August. Lincoln; Weeping Water.

1314. *Impatiens biflora* Walt. (*I. fulva* Nutt.) Spotted touch-me-not. Moist, shaded places; rare. Peru; Weeping Water; Richardson county, August 25; Dismal river in Thomas county, July 12.

511. OXALIS L. Wood sorrel.

1315. *Oxalis corniculata* L. var. *stricta* (L.) Sav. Yellow wood sorrel. Low prairies, moist woods, etc.; common. May–July. Otoe county; Lincoln; Weeping Water; Anselmo; Fairbury; Peru; Crete.

1316. *Oxalis violacea* L. Violet wood sorrel. Damp places; common. May. Lincoln; Fairbury; Peru; Crete; Weeping Water; Valentine; Long Pine.

### 116. LINACEÆ. (FLAX FAMILY.)

512. LINUM L. Flax.

1317. *Linum perenne* L. Dry prairies. June. Lincoln. P.

1318. *Linum perenne* L. var. *lewisii* Eat. & Wright. Nebraska. (Gray's Manual, p. 102.

1319. *Linum sulcatum* Riddell. Prairies, very common. June–July. Richardson, Fillmore, and Jefferson counties; Lincoln, Weeping Water, McCook, Crete, and Long Pine.

1320. *Linum striatum* Walt. Weeping Water. W.

### 117. RUTACEÆ. (RUE FAMILY.)

513. XANTHOXYLUM L. Prickly ash.

1321. *Xanthoxylum americanum* Mill. Northern prickly ash; toothache tree. River banks, common in eastern Nebraska. Peru; Wymore; Long Pine; Weeping Water; Nebraska City; Rulo.

### 118. ANACARDIACEÆ. (CASHEW FAMILY.)

514. RHUS L. Sumach.

1322. *Rhus aromatica* Ait. var. *trilobata* (Nutt.) Gr. High rocky ridges, common in western Nebraska. Long Pine; Valentine; Belmont; Hat Creek basin.

1323. *Rhus copallina* L. Dwarf sumach. Missouri river bottoms, common. Richardson county, August 25.

1324. *Rhus glabra* L. Smooth sumach. Open woods, banks of streams, etc., common. Lincoln; Fairbury; Crete; Peru; Brownville; Tecumseh; Beatrice; Weeping Water; Long Pine; Anselmo.

1325. *Rhus toxicodendron* L. Poison ivy; poison oak. Woods and river banks, common. Lincoln; Weeping Water; Peru; Crete; Belmont; Thedford; Anselmo.

### 119. SAPINDACEÆ. (SOAPBERRY FAMILY.)

515. **Staphylea** L. Bladder nut.

1326. *Staphylea trifolia* L. American bladder-nut. A bush, three to four metres (about ten or twelve feet) high. Missouri river bluffs, not uncommon. Richardson county; Cass county; Peru.

516. **Negundo** Mœnch. Box-elder.

1327. *Negundo aceroides* Mœnch. Box-elder. Along water courses, etc., common. April. Lincoln; Peru; Crete; Tecumseh; Long Pine; Weeping Water; Anselmo; Belmont; Hat Creek basin.

517. **Acer** L. Maple.

1328. *Acer dasycarpum* Ehrh. Silver maple; soft maple. Along water courses, common. April. Lincoln; Crete; Peru; Tecumseh; Weeping Water. Limited to the eastern part of the state.

1329. *Acer glabrum* Torr. Mountain maple; dwarf maple. Damp canons, common in northwestern part of the state. Hat Creek basin in Sioux county, August 1, 1889. A shrub or small tree, 2½–5 metres (8–15 feet) high.

### 120. POLYGALACEÆ. (MILKWORT FAMILY.)

518. **Polygala** L. Milkwort.

1330. *Polygala alba* Nutt. Prairies. Common. Belmont, July 18; Broken Bow, July 4; Anselmo, July 6; Dismal river in Thomas county, July 13.

1331. *Polygala cruciata* L. Nebraska. (Gray's Manual, p. 122.)

1332. *Polygala incarnata* L. Nebraska. (Gray's Manual, p. 121.)

1333. *Polygala verticillata* L. Dry soil, not uncommon. July–September. Crete; Weeping Water; McCook; Lincoln; Dakota county; Thomas county.

### 121. CELASTRACEÆ. (STAFF-TREE FAMILY.)

519. **Celastrus** L. Staff-tree; shrubby bitter-sweet.

1334. *Celastrus scandens* L. Wax-work; climbing bitter-sweet. Banks of streams, common. Lincoln; Peru; Crete; Weeping Water; Long Pine; Belmont.

520. **Euonymus** L. Spindle-tree.

1335. *Euonymus americanus* L. Strawberry bush. Weeping Water. W.

1336. *Euonymus americanus* L. var. *obovatus* Torr. & Gr. Weeping Water. W.

1337. *Euonymus atropurpureus* Jacq. Burning-bush; waahoo. Woods, common. June. Lincoln; Weeping Water; Crete; Peru.

### 122. RHAMNACEÆ. (BUCKTHORN FAMILY.)

521. **Ceanothus** L. New Jersey tea; red-root.

1338. *Ceanothus americanus* L. New Jersey tea. Prairies, common. June–July. Peru; Lincoln; Long Pine; Fairbury; Weeping Water.

1339. *Ceanothus ovatus* Desf. (Includes *C. ovalis* Bigel.) Red-root. Prairies, common. May–June. Lincoln; Weeping Water; Peru; Crete; Thedford; Anselmo.

522. **Rhamnus** L. Buckthorn.

1340. *Rhamnus alnifolia* L'Her. Nebraska. (Gray's Manual, p. 111.)

1341. *Rhamnus caroliniana* Walt. (*Frangula caroliniana* Gray.) Alder buckthorn. Ashland; Weeping Water.

1342. *Rhamnus lanceolatus* Pursh. Buckthorn. Wymore; Weeping Water.

## 123. AMPELIDEÆ. (VINE FAMILY.)

523. PARTHENOCISSUS Planch. Virginia creeper.

1343. *Parthenocissus quinquefolia* (L.) Planch. (*Ampelopsis quinquefolia* Michx. *Vitis quinquefolia* Lam.) Five-leaved ivy. Woods, etc. Lincoln; Weeping Water; Crete; Belmont; Anselmo.

524. VITIS L. Grape.

1344. *Vitis cordifolia* Michx. Nebraska. (Gray's Manual, p. 113.)

1345. *Vitis riparia* Michx. Wild grape. Wooded banks, etc. Peru; Crete; Weeping Water; Belmont; Anselmo.

1346. *Vitis æstivalis* Michx. Summer grape. Weeping Water. W.

## 124. EUPHORBIÆ. (SPURGE FAMILY.)

525. ACALYPHA L. Three-seeded mercury.

1347. *Acalypha virginica* L. Three-seeded mercury. Moist woods, etc.; common. August. Lincoln.

526. CROTON L. Croton.

1348. *Croton texensis* Muell. Prairies; common. July–August. Fort Robinson; Long Pine; Anselmo; Belmont; Broken Bow; Thedford.

527. EUPHORBIA L. Spurge.

1349. *Euphorbia corollata* L. Prairies ~~and~~ ~~roadsides~~; common. July–August. Lincoln; Peru; Weeping Water; Saunders county.

1350. *Euphorbia* CYPARISSIAS L. Escaped in places. Crete, July 4.

1351. *Euphorbia dentata* Michx. Low grounds; not uncommon. October. Lincon.

1352. *Euphorbia dictyosperma* Fisch. & Meyer. Prairies. Fairbury; Lincoln.

1353. *Euphorbia flagelliformis* Engelm. July–August. Fort Robinson; Valentine. U.

1354. *Euphorbia glyptosperma* Engelm. Prairies. Fairbury; Weeping Water; Lincoln.

1355. *Euphorbia hexagona* Nutt. Dry places; not uncommon. Douglas county; Norfolk; Alliance; Belmont.

1356. *Euphorbia heterophylla* L. Open woods, rare. Lincoln; Crete; Weeping Water.

1357. *Euphorbia humistrata* Engelm. Yards, etc., Lincoln; Weeping Water.

1358. *Euphorbia hypericifolia* L. Open woods, etc.; common. Lincoln; Crete; Weeping Water; Saunders county.

1359. *Euphorbia maculata* L. Prairies and waste places; common. Lincoln; Weeping Water; Seward county; Saunders county.

1360. *Euphorbia marginata* Pursh. Snow-on-the-mountain. Prairies and waste places; very common. July–August. Peru; Lincoln; Weeping Water; Anselmo.

1361. *Euphorbia montana* Engelm. Usually in high, rocky places. July-August. Fort Robinson; Belmont; Hat Creek basin.

1362. *Euphorbia obtusata* Pursh. Low prairies, rare. Lincoln.

1363. *Euphorbia petaloidea* Engelm. Prairies; common westward. Schuyler; Kearney; Louisville; Anselmo; Belmont.

1364. *Euphorbia serpyllifolia* Pers. Fort Robinson. July. B.

## 125. UMBELLIFERÆ. (PARSLEY FAMILY.

528. CRYPTOTÆNIA DC. Honewort.

1365. *Cryptotænia canadensis* (L.) DC. Thickets; common. July. Lincoln; Crete; Weeping Water.

529. CICUTA L. Water hemlock.

1366. *Cicuta maculata* L. Spotted cowbane; musquash root; beaver poison. Wet places, common. August. Lincoln; Crete; Weeping Water.

530. ZIZIA Koch.

1367. *Zizia aurea* Koch. (*Thaspium aureum* var. *apterum* Gray.) Meadow parsnip. Damp woods. May. Weeping Water.

531. OSMORRHIZA Raf. Sweet cicely.

1368. *Osmorrhiza longistylis* (Torr.) DC. Smoother sweet cicely. Wooded banks, and canons, common. May–July. Milford; Weeping Water; Peru; Belmont; Anselmo; Dismal river in Thomas county.

532. MUSENIUM Nutt.

1369. *Musenium tenuifolium* Nutt. High rocky ridges, common. Hat Creek basin, Sioux county, August 2; Belmont, July 25; Cheyenne county, August 7.

533. APIASTRUM Nutt.

1370. *Apiastrum patens* (Nutt.) Coulter & Rose. (*Apium patens* of Watson's Index.) Sandy soil. June. U.

534. SANICULA L. Sanicle.

1371. *Sanicula canadensis* L. Black snake-root. Woods, common. July. Douglas county; Lincoln; Long Pine; Weeping Water; Belmont; Hat Creek basin in Sioux county.

1372. *Sanicula marylandica* L. Black snake-root. Open woods, common, May–June. Weeping Water; Peru; Crete.

535. THASPIUM Nutt. Meadow parsnip.

1373. *Thaspium barbinode* (Michx.) Nutt. Meadow parsnip. Prairies, rare. June. Lincoln.

536. CYMOPTERUS Raf.

1374. *Cymopterus montanus* Torr & Gr. Valentine. May. U. (Also according to Gray's Manual, p. 204.)

537. PUCEDANUM L.

1375. *Pucedanum fœniculaceum* Nutt. Prairies, early spring, very common. April–May. Lincoln; Fairbury; Crete; Wymore; Weeping Water; South Bend.

1376. *Pucedanum nudicaule* Nutt. Prairies. Valentine; McCook; Beaver City.

1377. *Pucedanum villosum* Nutt. Nebraska. (Coulter's Manual.)

538. POLYTÆNIA DC.

1378. *Polytænia nuttallii* DC. Prairies, etc. Lincoln, August.

539. HERACLEUM L. Cow parsnip.

1379. *Heracleum lanatum* Michx. Cow parsnip. Damp wooded canons. Belmont; Long Pine.

### 126. CORNACEÆ. (DOGWOOD FAMILY.)

540. CORNUS L. Cornel; dogwood.

1380. *Cornus asperifolia* Michx. Rough-leaved dogwood. Banks of streams. June. Lincoln; Crete; Weeping Water.

1381. *Cornus candidissima* Marsh. (*C. paniculata* L'Her.) White-fruited dogwood. Weeping Water. W.

1382. *Cornus sericea* L. Silky cornel; kinnikinnik. Peru; Weeping Water.

1383. *Cornus stolonifer* Michx. Red osier dogwood. Canons, common. Long Pine; Weeping Water.

### 127. CRASSULACEÆ. (ORPINE FAMILY.)

541. PENTHORUM L. Ditch stone-crop.

1384. *Penthorum sedoides* L. Ditch stone-crop. Banks of streams, common. July. Lincoln; Weeping Water.

542. SEDUM L. Stone-crop; orpine.

1385. *Sedum stenopetalum* Pursh. High, rocky ridges, not common. Hat Creek basin, in Sioux county, August 2.

### 128. SAXIFRAGACEÆ. (SAXIFRAGE FAMILY.)

543. RIBES L. Currant; gooseberry.

1386. *Ribes aureum* Pursh. Buffalo, or Missouri currant. May–June. Valentine; Long Pine; Anselmo; Belmont.

1387. *Ribes cynosbati* L. Prickly gooseberry. Antelope county. (Herb. E. R. McGee.)

1388. *Ribes cereum* Dougl. Squaw currant. Rocky bluffs, common in the northwestern part of the state. Belmont; Hat Creek basin.

1389. *Ribes floridum* L'Her. Wild black currant. Wooded banks of streams, common. Antelope county; Belmont; Anselmo; Dismal river, in Thomas county.

1390. *Ribes rotundifolium* Michx. Common wild gooseberry. Banks of streams, common. May. Peru; Crete; Tecumseh; Weeping Water; Belmont.

1391. *Ribes rubrum* L. Red currant. Weeping Water. W.

544. HEUCHERA L. Alum root.

1392. *Heuchera hispida* Pursh. May–July. Ashland; Belmont.

### 129 HAMAMELACEÆ. (WITCH-HAZEL FAMILY.)

545. HAMAMELIS L. Witch-hazel.

1393. *Hamamelis virginica* L. Damp woods. Weeping Water. W.

### 130. CACTACEÆ. (CACTUS FAMILY.)

546. OPUNTIA Tourn.

1394. *Opuntia fragilis* Haw. On high, rocky prairies. Long Pine; Belmont.

1395. *Opuntia missouriensis* DC. Dry, rocky hills, sand hills, etc., common. Weeping Water; Long Pine; Chadron; Belmont; Thedford.

1396. *Opuntia rafinesquii* Engelm. Rocky prairies. Belmont; Long Pine.

547. MAMILLARIA Haw.

1397. *Mamillaria vivipara* Haw. Sand hills. Whitman; Thedford; Belmont.

### 131. LOASACEÆ. (LOASA FAMILY.)

548. MENTZELIA L.

1398. *Mentzelia lævicaulis* Torr. & Gr. Prairies. July–September. Box Butte county; Fort Robinson; Belmont; Alliance.

1399. *Mentzelia ornata* Torr. & Gr. Prairies and barren places in "bad lands." Belmont; Chadron; Hat Creek basin.

### 132. ONAGRACEÆ. (EVENING-PRIMROSE FAMILY.)

549. CIRCÆA L. Enchanter's nightshade.

1400. *Circæa lutetiana* L. Damp, shaded places, rather uncommon. Long Pine; Dismal river in Thomas county, July 13, 1889.

550. GAURA L. Gaura.

1401. *Gaura biennis* L. Roadsides and waste places. Common. August. Lincoln, Peru; Crete; Weeping Water; Seward.

1402. *Gaura coccinea* Nutt. Roadsides and prairies. Not uncommon in western and central regions. Fort Robinson; Lincoln; Nelson; Hardy; Cheyenne county; Broken Bow; Belmont; Thedford; Hat Creek basin.

1403. *Gaura parviflora*. Dougl. Roadsides and prairies, common. July–August. Lincoln; Weeping Water; Crawford.

551. ŒNOTHERA L. Evening primrose.

1404. *Œnothera albicaulis* Nutt. White stemmed evening primrose. Prairies, common. Fort Robinson; Long Pine; Alliance, July 14; Belmont, July 24; Hat Creek basin, August 1. Very variable. A smooth stemmed form is perhaps the most common. There is also a puberulent form and a sinnate-leaved puberulent form that are by no means uncommon.

1405. *Œnothera biennis* L. Common evening primrose, Waste places, common. July-September. Lincoln; Weeping Water; Peru; Hastings; Long Pine; Tecumseh; Dismal river in Thomas county; Hat Creek basin; Belmont.

1406. *Œnothera cæspitosa* Nutt. Denuded places in "bad lands." Rare. Hat Creek basin, August 1.

1407. *Œnothera canescens* Torr. Cheyenne county. W.

1408. *Œnothera coronopifolia* Torr. & Gr. Prairies. Belmont, July 24; Hat Creek basin, August 1; Alliance, July 14.

1409. *Œnothera missouriensis* Sims. In rocky grounds. Holmesville, July. Abundant in old magnesium limestone quarry. White roots, fleshy, two feet long.

1410 *Œnothera pinnatifida* Nutt. In bunches on prairie. Red Willow county; Cheyenne county. U.

1411. *Œnothera rhombipetala* Nutt. Long Pine; prairies. B.

1412. *Œnothera sinuata* L. Prairies. May–August. Thedford; Fairbury; Crete; Hastings.

1413. *Œnothera serrulata* Nutt. Prairies, very common. June–August. Lincoln; Aurora; Peru; Diller; Crete; Nelson; Fairbury; Anselmo; Thedford; Belmont; Hat Creek basin, and Antelope county.

1414. *Œnothera triloba* Nutt. var. *parviflora* Watson. Nebraska. (Coulter's Manual, p. 104.)

552. LUDWIGIA L. False loosestrife.

1415. *Ludwigia palustris* (L.) Ell. Louisville, August.

1415½. *Ludwigia polycarpa* Short & Peter. Edges of ponds, common. Lincoln.

553. EPILOBIUM L. Willow herb.

1416. *Epilobium coloratum* Muhl. July. Weeping Water; Anselmo; Thedford; Belmont; Hat Creek basin.

1416½. *Epilobium adenocaulon* Haussk. Canons of Pine Ridge; Belmont; July 25.

1417. *Epilobium lineare* Muhl. Wet places, rare. Thedford, August 7.

1418. *Epilobium spicatum* Lam. Damp wooded canons, rare. Belmont, July 20.

### 133. HALORAGEÆ. (WATER MILFOIL FAMILY.)

554. MYRIOPHYLLUM L.

1419. *Myriophyllum pinnatum* (Walt.) B. S. P. (*M. scabrum* Michx.) Water milfoil. Fresh water ponds. July. Lincoln.

### 134. LYTHRACEÆ. (LOOSESTRIFE FAMILY.)

555. **Lythrum** L. Loosestrife.

1420. *Lythrum alatum* Pursh. Loosestrife. Low grounds, common. July. Lincoln; Long Pine; Anselmo; Thedford.

556. **Ammania** L.

1421. *Ammania coccinea* Rottb. (*A. latifolia* Gr., not L.) Low, wet grounds, common. July. Lincoln.

1422. *Ammania ramosior* L. (*A. humilis* Michx.) Low wet places. Lincoln.

### 135. ELÆAGNACEÆ. (OLEASTER FAMILY.)

557. **Shepherdia** Nutt. Buffalo berry.

1423. *Shepherdia argentea* Nutt. Buffalo berry. Hills and bluffs. A thorny bush. Valentine; Long Pine; Broken Bow; Anselmo; Crawford; Dismal river in Thomas county. Very common.

### 136. ROSACEÆ. (ROSE FAMILY.)

558. **Amelanchier** Lindl. June-berry; service berry; shad-bush.

1424. *Amelanchier alnifolia* Nutt. June-berry. Canons, not common. Hat Creek basin, August 1; Belmont, July 24; Long Pine.

1425. *Amelanchier canadensis* (L.) Medicus. var. *botryapium* (Willd.) Gray. June berry; service berry. April-June. Peru; Nebraska City.

559. **Cratægus** L. Hawthorn; white thorn.

1426. *Cratægus tomentosa* L. Black, or pear thorn. Wooded banks. April. Omaha; Brownville.

560. **Pyrus** L. Pear; apple.

1427. *Pyrus coronaria* L. American crab apple. Wooded bluffs. Peru.

561. **Rosa** L. Rose.

1428. *Rosa arkansana* Porter. Prairies and woods, very common. June–August. Antelope county; Lincoln; Long Pine; Crete; Weeping Water; Belmont; Broken Bow; Anselmo; and Dismal river, in Thomas county. Distinguished from its near relatives with infrastipular spines (*R. blanda* and *R. sayi*) by its narrow glandular-toothed stipules, 7–11 leaflets, lobed outer sepals, and more prickly stem. It is the most common rose in Nebraska, varying from 15–180 cm. (½–6 ft.) in height. My Broken Bow specimens differ somewhat from the type, being but slightly prickly and having somewhat dilated stipules, otherwise typical. They are probably merely a form.

1429. *Rosa blanda* Ait. Early. Early wild rose. Prairies and fields. May. Fairbury. U.

1430. *Rosa fendleri* Crepin. In wooded canons. Belmont, July 18. Very rank, fully 2½ metres (8 feet) high.

1431. *Rosa setigera* Michx. Climbing, or prairie rose. Wooded bottoms of the Missouri river, common. Richardson county, August 25, (in fruit). Bush somewhat climbing, from 1.2–2.1 metres (4–7 feet) high. The common name — prairie rose — from observations in Nebraska, is a faulty designation.

1432. *Rosa woodsii* Lindl. In ravines and on prairies. Fort Robinson, July; Belmont, July 27; Hat Creek basin, August 1. Apparently the most common rose in northwest Nebraska, in and on the outskirts of the "bad lands" ("Nebraska, on White river, Smith's Fork, and in the 'bad lands.'"—Hayden.) Distinguished from *R. fendleri* and other related species with persistent sepals and infrastipular spines by having the outer sepals latterly lobed. The fruits and sepals, so far as I have been able to observe them, are lighter colored than in other Nebraska species, being usually orange yellow, with merely a pinkish tinge.

562. POTERIUM L. Burnet.

1433. *Poterium* SANGUISORBA L. Garden burnet. Escaped. Lincoln.

563. AGRIMONIA L. Agrimony.

1434. *Agrimonia eupatoria* L. Common agrimony. Borders of woods; not uncommon. July–August. Lincoln; Weeping Water; Belmont; Hat Creek basin.

564. POTENTILLA L. Five-finger.

1435. *Potentilla arguta* Pursh. Low prairies, banks of streams, etc. June–July. Weeping Water; Lincoln; Broken Bow.

1436. *Potentilla canadensis* L. var. *simplex* (Michx.) T. & G. Weeping Water.

1437. *Potentilla hippiana* Lehm. High prairies; common in western Nebraska. Belmont, July 18; Hat Creek basin, August 2.

1438. *Potentilla norvegica* L. Woods and waste places; common. July–August. Dakota county; Lincoln; Weeping Water; Anselmo; Belmont.

1439. *Potentilla pennsylvanica* L. Weeping Water and prairies of Loup River valley; Thedford, July 14.

1440. *Potentilla rivalis* Nutt. Low grounds; common. July. Lincoln; Weeping Water; Peru.

1441. *Potentilla rivalis* Nutt. var. *millegrana* (Engelm.) Watson. Weeping Water; Louisville. W.

565. FRAGARIA L. Strawberry.

1442. *Fragaria vesca.* Wild strawberry. Wooded banks and canons; common in central and western Nebraska. Long Pine, July; Belmont, July 18; Hat Creek basin, August 2; Anselmo, July 6; Dismal river in Thomas county, July 12.

1443. *Fragaria virginiana* Duchesne, var. *illinoensis* Gray. Common wild strawberry. Wooded banks, prairies, waste places, etc.; common. May–June. Lincoln; Weeping Water; Peru; Crete; Long Pine; Chadron.

566. GEUM L. Avens.

1444. *Geum album* Gmel. Avens. In woods; common. July–August. Lincoln; Peru; Anselmo.

1445. *Geum strictum* Ait. Yellow avens. Woods in canons. Belmont, July 18; Dismal river, July 12; Long Pine, July.

1446. *Geum virginianum* L. Avens. Weeping Water. W.

567. RUBUS L. Raspberry; blackberry.

1447. *Rubus occidentalis* L. Black raspberry; thimbleberry. Woods. May. Peru; Crete.

1448. *Rubus strigosus* Michx. Wild red raspberry. Thickets, etc., common. June–July. Lincoln; Weeping Water, Peru; Anselmo, and Dismal river in Thomas county.

1449. *Rubus villosus* Ait. Common or high blackberry. In eastern part of state. B.

568. NIELLIA Don. Nine-bark.

1450. *Niellia opulifolia* (L.) Benth. & Hook. In canons. Long Pine. B.

569. PRUNUS L. Plum; cherry.

1451. *Prunus americana* Marshall. Wild yellow or red plum. Banks of creeks, etc., common. April–May. Lincoln; Weeping Water; Peru; Valentine; Crete.

1452. *Prunus demissa* Walpers. Wild cherry. In "draws" along water courses, etc., common. Probably throughout central and western Nebraska. Belmont, July 25; Anselmo, July 6; Dismal river, Thomas county, July 12; Long Pine; Valentine. A small leafy tree from 1–3 metres (3–10 ft.) high. Easily recognized by two dark glands that occur at the base of the leaf. A prolific bearer, fruits ripening in August.

1453. *Prunus pumila* L. Sand cherry; dwarf cherry. Dry sandy or usually somewhat barren unoccupied ground. Sand hills of central Nebraska and growing from crevices between rocks in the "bad lands." May. Antelope county; Pierce; Valentine; Anselmo; Thedford; Alliance; Hat Creek basin. The largest and juiciest of our wild cherries. The fruits are very commonly used by the settlers on their tables. An attempt at cultivation would, I think, be well rewarded, especially in our sandy, central, and barren northwestern regions. The fruits are frequently injured by the little white larva of a snout beetle or sand cherry gouger (*Coccotorus scutellaris* Lec.), which works in the stone.

1454. *Prunus serotina* Ehrh. Wild black cherry. Peru; Weeping Water.

1455. *Prunus virginiana* L. Choke cherry. Rich woods. May. Lincoln; Peru; Weeping Water; Crete.

### 137. LEGUMINOSÆ. (PULSE FAMILY.)

570. SCHRANKIA Willd.

1456. *Schrankia uncinata* Willd. Sensitive brier. Prairies, not uncommon Cambridge; Peru; Fairbury; Harlan county.

571. DESMANTHUS Willd. Desmanthus.

1457. *Desmanthus brachylobus* (DC.) Benth. Roadsides, not very common. July. Lincoln; Brownville.

572. CERCIS L. Red bud; Judas tree.

1458. *Cercis canadensis* L. Red bud. Wooded banks, common. Peru; Weeping Water; Wymore; Nemaha City; Rulo.

573. CASSIA L. Senna.

1459. *Cassia chamæcrista* L. Partridge pea; wild sensitive plant. Very common in waste places, roadsides, etc. July–September. Lincoln; Peru; Tecumseh; Crete; Weeping Water.

1460. *Cassia marilandica* L. Wild senna. Roadsides, rare. July. Lincoln; Peru.

574. GLEDITSCHIA L.

1461. *Gleditschia triacanthos* L. Three-thorned acacia, or honey locust. Banks of streams. May–June. Lincoln; Weeping Water; Tecumseh; Crete.

575. GYMNOCLADUS Lam. Kentucky coffee tree.

1462. *Gymnocladus canadensis* Lam. Wooded banks of streams, common. Saltillo; Rulo; Nemaha City; West Point.

576. SOPHORA L.

1463. *Sophora sericea* Nutt. Prairies. June–July. Cambridge; McCook; and Red Willow county.

577. PHASEOLUS L. Kidney bean.

1464. *Phaseolus angulosus* (Muhl.) Ort. (*P. diversifolius* Pers.) Wild bean. Banks of streams, common. July–August. Lincoln; Louisville; Weeping Water; Peru; Seward county.

1465. *Phaseolus pauciflorus* Benth. River banks, not uncommon. July–September. Lincoln.

1466. *Phaseolus polystachyus* (L.) B. S. P. (*P. perennis* Walt.) Weeping Water. W.

578. GALACTIA P. Br. Milk pea.

1467. *Galactia pilosa* Ell. (*G. mollis* Gray, not Michx.) Weeping Water. W.

579. APIOS Mœnch.

1468. *Apios tuberosa* Mœnch. Ground nut; wild bean. River banks, becoming common. July–August. Crete; Peru; Rulo; Weeping Water; Lincoln.

580. AMPHICARPÆA Ell.

1469. *Amphicarpæa comosa* (L.) Ridd. (*A. monoica* Ell.) Hog peanut. Damp woods, common. July–August. Lincoln; Peru; Weeping Water.

581. LATHYRUS L.

1470. *Lathyrus polymorphus* Nutt. Everlasting pea. Prairies, etc. May–July. West Point; Pierce; Fort Robinson; Valentine; Broken Bow; Anselmo; Belmont; Thedford, and Antelope county.

582. VICIA L. Vetch; tare.

1471. *Vicia americana* Muhl. Common vetch. Roadsides, etc., common. May–June. Weeping Water; Nebraska City.

1472. *Vicia americana* Muhl. var. *linearis* (Nutt.) Watson. Prairies, common (more common than the type). May–June. Lincoln; Fairbury; Gordon; Crete; Weeping Water, and Antelope county.

1473. *Vicia americana* Muhl. var. *truncata* (Nutt.) Brewer. Peru; Weeping Water.

583. LESPEDEZA Michx. Bush clover.

1474. *Lespedeza frutescens* (Willd.) Ell. (*L. capitata* Michx.) Bush clover Prairies, common. August–September. Lincoln; Tecumseh; Weeping Water; Nemaha City.

584. DESMODIUM Desv. Tick-trefoil.

1475. *Desmodium canadense* (L.) DC. Tick-trefoil. Prairies and waste places, common. July–October. Weeping Water; Peru; Tecumseh; Lincoln; Broken Bow; Thedford.

1476. *Desmodium canescens* (L.) DC. Tick-trefoil. Weeping Water; Lincoln.

1477. *Desmodium grandiflorum* (Walt.) DC. (*D. acuminatum* DC.) Tick-trefoil. Damp woods, rather common. July. Lincoln; Crete; Weeping Water.

1478. *Desmodium dillenii* Darl. Tick-trefoil. Weeping Water. W.

1479. *Desmodium rigidum* (Ell.) DC. Tick-trefoil. Roadsides. Lincoln; Weeping Water.

1480. *Desmodium paniculatum* (L.) DC. Wooded bluffs of the Missouri river. Richardson county, August 25.

585. GLYCYRRHIZA L. Liquorice.

1481. *Glycyrrhiza lepidota* Pursh. Wild liquorice. Prairies, very common. July–August. Lincoln; Crete; Weeping Water; Anselmo; Thedford; Belmont; Hat Creek basin.

586. OXYTROPIS DC.

1482. *Oxytropis lamberti* Pursh. Prairies, common. Harvard; Gordon; Kenesaw; McCook; Broken Bow; Belmont; Antelope and Hitchcock counties.

1483. *Oxytropis lamberti* Pursh. var. *sericea* Gray. Belmont, July 18. (A specimen in fruit seems to be this variety.)

1484. *Oxytropis podocarpa* Gray. Prairies, rare. Thedford; Thomas county, July 14.

587. ASTRAGALUS L. Rattle-weed.

1485. *Astragalus adsurgens* Pall. Prairies, not very common. Belmont, July 24.

1486. *Astragalus bisulcatus* Gray. Nebraska. (Coulter's Manual.)

1487. *Astragalus cæspitosus* Gray. High prairies, common. Hat Creek basin, August 2; Belmont, July 24. Forming dense cæspitose masses on high rocky places. Leaves simple, sericeous, scapes slightly exceeding the leaves. Differs from *A. simplicifolius* Gray, in its longer leaves and scapes.

1488. *Astragalus canadensis* L. Prairies and edges of woods, common. July–September. Peru; Lincoln; Weeping Water; Belmont.

1489. *Astragalus caryocarpus* Ker. Ground plum; buffalo pea. Prairies, very common. April–July. Fairbury; Crete; Lincoln; Weeping Water; Valentine; Belmont.

1490. *Astragalus drummondii* Dougl. Common on prairies, forming erect bushy clumps. Belmont, July 27, (in fruit).

1491. *Astragalus flexuosus* Dougl. Nebraska. (Coulter's Manual, p. 67.)

1492. *Astragalus hypoglottis* L. Prairies, etc. Belmont, July 24. (In flower and fruit.)

1493. *Astragalus kentrophyta* Gray. Dry, almost barren, ground in open canons. Belmont, July 21.

1494. *Astragalus lotiflorus* Hook. Nebraska. (Coulter's Manual, p. 63.)

1495. *Astragalus gracilis* Nutt. Sandy prairies, not uncommon. June–July. Red Willow county; Fort Robinson; Anselmo, and Dismal river in Thomas county.

1496. *Astragalus mexicana ?* A. DC. Prairies. Belmont, July 27.

1497. *Astragalus microlobus* Gray. Nebraska. (Coulter's Manual, p. 62.)

1498. *Astragalus missouriensis* Nutt. Nebraska. (Coulter's Manual, p. 64.)

1499. *Astragalus mollissimus* Torr. Common loco. Prairies, common westward. Harvard; Cambridge; Dwight; McCook; Brule; Alliance; Crawford.

1500. *Astragalus multiflorus* Gray. In barren gulches of the "bad lands." Hat Creek basin, August 2.

1501. *Astragalus pectinatus* Dougl. Nebraska. (Coulter's Manual, p. 67.)

1502. *Astragalus pictus* Gray. Bird-egg pea. Sand hills, common in central Nebraska. Anselmo, July 8; Dismal river in Thomas county, July 13. Pod ovoid, large, inflated, beautifully mottled with reddish purple and straw color.

1503. *Astragalus plattensis* Nutt. Prairies, rare. April–May. Lincoln; Belmont, July 18. (In fruit.)

1504. *Astragalus racemosus* Pursh. Nebraska. (Coulter's Manual, p. 62.)

1505. *Astragalus sericoleucus* Gray. Edges of rocky bluffs, etc., common. Belmont, July 21; Cheyenne county, May. Its leafy stems form whitish cushions, against which the deep blue flowers form a pleasing contrast.

1506. *Astragalus shortianus* Nutt. Prairies. May–June. Valentine; Red Willow county.

1507. *Astragalus triphyllus* Pursh. Prairies. Belmont, July 25.

588. ROBINIA L. Locust tree.

1508. *Robinia pseudacacia* L. Common locust; false acacia. Escaped along streams. May. Lincoln; Peru.

589. PETALOSTEMON Michx. Prairie clover.

1509. *Petalostemon candidus* Michx. White prairie clover. Prairies; common. Lincoln; Fairbury; Peru; Tecumseh; Crete; Weeping Water; Broken Bow; Hat Creek basin.

1510. *Petalostemon violaceus* Michx. Purple prairie clover. Prairies; common. July–August. Fairbury; Lincoln; Peru; Crete; Long Pine; Weeping Water; Anselmo; Dakota county.

1511. *Petalostemon villosus* Michx. Villose prairie clover. Sandy prairies; common. July–August. Valley Junction; Ewing; Anselmo; Alliance; Thedford.

590. DALEA L. Dalea.

1512. *Dalea alopecuroides* Willd. Prairies; common. July–August. Lincoln; Seward county.

1513. *Dalea aurea* Nutt. Prairies. July. Valentine. B.

1514. *Dalea lanata* Spreng. Nebraska. (Coulter's Manual, p. 58.)

1515. *Dalea laxiflora* Pursh. Prairies; common. Nelson; Long Pine; McCook; Kearney; Broken Bow; Phelps county.

591. AMORPHA L. False indigo; lead plant.

1516. *Amorpha canescens* Nutt. Lead plant. Prairies; very common. June–September. Lincoln; Crete; Peru; Weeping Water; Fort Robinson; Anselmo; Thedford.

1517. *Amorpha fruticosa* L. False indigo. River banks; common. June–July. Lincoln; Crete; Weeping Water; Valentine.

592. PSORALEA L. Psoralea.

1518. *Psoralea argophylla* Pursh. Silver leaf. Prairies; common. June–July. Lincoln; Weeping Water; Crete; Hastings; Belmont; Anselmo.

1519. *Psoralea campestris* Nutt. Sandy prairies; common westward. July. Fort Robinson; Anselmo; Dismal river in Thomas county; Hat Creek basin in Sioux county; Antelope county.

1520. *Psoralea esculenta* Pursh. *Pomme blanche* or *Pomme de prairie*. Prairies; common. Lincoln; Gordon; Crete; Cambridge; Hardy; Weeping Water; Valentine; Belmont.

1521. *Psoralea lanceolata* Pursh. Prairies; common westward. July–August. Antelope county; Fort Robinson; Anselmo; Thedford; Belmont; Hat Creek basin.

1522. *Psoralea tenuiflora* Pursh. (*P. floribunda* Nutt.) Prairies; everywhere common. June–August. Lincoln; Fairbury; Weeping Water; Crete; Chadron; Broken Bow.

593. HOSACKIA Douglas.

1523. *Hosackia purshiana* Benth. Quite common on low prairies. July–August. Lincoln; Crete; Aurora; Anselmo; Broken Bow; Belmont.

594. TRIFOLIUM L. Clover; trefoil.

1524. *Trifolium* PRATENSE L. Red clover. Escaped to roadsides and waste places. June–August. Lincoln; Peru; Crete; Weeping Water; Furnas county. The zigzag clover (*T. medium* L.) undoubtedly occurs frequently as an escape also, but specimens have not been gathered.

1525. *Trifolium* REPENS L. White clover. Introduced. Waste places, common. Lincoln; Peru; Weeping Water; Crete.

1526. *Trifolium reflexum* L. Buffalo clover. Weeping Water. W.

1527. *Trifolium stoloniferum* Muhl. Running buffalo clover. Waste places. Lincoln, Louisville. W.

595. MELILOTUS Juss. Sweet clover; melilot.

1528. *Melilotus* ALBA Lam. White melilot. Waste grounds. July–August. Lincoln; Crete; Dakota county.

1529. *Melilotus* OFFICINALIS (L.) Lam. Yellow melilot. Waste places near dwellings, common. June. Lincoln; Weeping Water.

596. MEDICAGO L. Medick.

1530. *Medicago* LUPULINA L. Waste places. May–July. Escaped. Lincoln.

1531. *Medicago* MACULATA Willd. Escaped to waste places. Weeping Water.

1532. *Medicago* SATIVA L. Lucerne; "alfalfa." Waste places. July. Esscaped. Lincoln; Weeping Water; Furnas county.

597. LUPINUS L. Lupine.

1533. *Lupinus plattensis* Watson. Prairies, etc., common in the western part of the state. July–August. Belmont; Hat creek basin; Fort Robinson.

598. CROTALARIA L. Rattle-box.

1534. *Crotalaria sagittalis* L. Rattle-box. July–August. Waste places. Peru; Dakota county.

599. BAPTISIA Vent. False indigo.

1535. *Baptisia leucantha* Torr. & Gr. Low prairies, not common. July. Lincoln; Crete; Weeping Water.

1536. *Baptisia leucophæa* Nutt. Yellow false indigo. Low prairies, common. May–June. Lincoln; Crete; Fairbury; Peru; Weeping Water.

600. THERMOPSIS R. Br.

1537. *Thermopsis rhombifolia* Richardson. High prairies, rocky ridges, etc., not uncommon. Belmont; North Platte; Valentine. Pods very long, 5–7½ cm. (2–3 in.); variously much curved.

### 138. SANTALACEÆ. (SANDALWOOD FAMILY.)

601. COMANDRA Nutt. Bastard toad-flax.

1538. *Comandra pallida* A. DC. High prairies, or rocky ridges, not uncommon in the western part of the state. Dismal river, in Thomas county; Belmont; Hat Creek basin.

1539. *Comandra umbellata* (L.) Nutt. Common bastard toad-flax. Rocky wood hills, dry prairies, etc.; common. May–June. Weeping Water; Lincoln; Valentine.

### 139. PRIMULACEÆ. (PRIMROSE FAMILY.)

602. GLAUX Tourn. Sea-milkwort.

1540. *Glaux maritima* L. Nebraska. (Gray's Manual, p. 331.)

603. STEIRONEMA Raf. Loosestrife.

1541. *Steironema ciliatum* (L.) Raf. (*Lysimachia ciliata* L.) Loosestrife. Low grounds, common. July–August. Lincoln; Peru; Crete; Weeping Water.

1542. *Steironema lanceolatum* (Walt.) Gray. (*Lysimachia lanceolata* Walt.) Loosestrife. Nebraska. (Coulter's Manual.)

604. ANDROSACE Tourn.

1543. *Androsace occidentalis* Pursh. Low grounds, prairies, common. May–June. Lincoln; Fairbury; Weeping Water.

### 140. CONVOLVULACEÆ. (CONVOLVULUS FAMILY.)

605. CUSCUTA L. Dodder; love-vine.

1544. *Cuscuta arvensis* Beyrich. On *Polygonum* and various low plants. August. Lincoln; Fort Robinson.

1545. *Cuscuta chlorocarpa* Engelm. On *Monarda*, *Polygonum*, *Ribes*, *Salix*, etc. August. Lincoln; Weeping Water.

1546. *Cuscuta cuspidata* Engelm. On *Ambrosia*, *Helianthus* and various *compositæ* and *Leguminosæ*. Common. July–August. Lincoln; Long Pine; Weeping Water.

1547. *Cuscuta glomerata* Choisy. On various weeds, common. Lincoln; Crete; Weeping Water.

1548. *Cuscuta decora* Choisy. Weeping Water. W.

1549. *Cuscuta gronvovii* Willd. On *Ambrosia*, *Helianthus*, and various large weeds. Lincoln.

1550. *Cuscuta inflexa* Engelm. Nebraska. (Gray's Manual, p. 372.)

606. EVOLVULUS L.

1551. *Evolvulus argenteus* Pursh. Prairies, rare. Kearney county.

607. CONVOLVULUS L. Bindweed.

1552. *Convolvulus incanus* Vahl. Waste places, rare. Lincoln.

1553. *Convolvulus sepium* L. (*Calystegia sepium* A. Br. in part.) Hedge bindweed. Cultivated fields, too common. July–August. Lincoln; Crete; Weeping Water.

1554. *Convolvulus sepium* L. var. *repens* (L.) Gray (var. *pubescens* Gray). Fairbury; Lincoln. U.

608. IPOMŒA L. Morning glory.

1555. *Ipomœa* HEDERACEA Jacq. Morning glory. In the older settled portions of the state this has escaped to roadsides and fields. Richardson county, August 26.

1556. *Ipomœa leptophylla* Torr. Bush morning glory. Prairies, common in central and western Nebraska. July. Box Butte county; Long Pine; Belmont; Hat Creek basin, and Dismal river in Thomas county.

1557. *Ipomœa* PURPUREA Lam. Common morning glory. Escaped to cultivated grounds. Richardson county, August 26.

### 141. POLEMONIACEÆ. (POLEMONIUM FAMILY.)

609. GILIA Ruiz. & Pav.

1558. *Gilia aggregata* Spreng. West Nebraska. (Coulter's Manual, p. 249.)

1559. *Gilia iberidifolia* Benth. Nebraska. (Coulter's Manual, p. 251.)

1560. *Gilia longiflora* (Gray) Don. (*Collomia longiflora* Gray.) Sand hills. July–September. Long Pine; Crawford.

1561. *Gilia pumila* Nutt. Dry, rocky ridges; not uncommon. Belmont; Hat Creek basin; Long Pine.

1562. *Gilia* TRICOLOR Benth. Roadsides, etc.; escaped. June. Lincoln.

610. PHLOX L. Phlox.

1563. *Phlox douglasii* Hook. High, rocky ridges, etc.; not uncommon. May–July. Valentine; Hat Creek basin.

1564. *Phlox douglasii* Hook. var. *longifolia* Gray. West Nebraska. (Coulter's Manual, p. 248.)

1565. *Phlox divaricata* L. Wild phlox. Woods, etc.; common. May–June. Weeping Water; Peru; Richardson county.

1566. *Phlox hoodii* Richards. Gordon. U.

1567. *Phlox pilosa* L. Prairie phlox. Prairies and edges of woods; common. May. Weeping Water; Richardson county; Omaha.

### 142. HYDROPHYLLACEÆ. (WATER-LEAF FAMILY.)

611. ELLISIA L.

1568. *Ellisia nyctelea* L. (Includes *E. ambigua* Nutt.) Damp, shaded places; common. May–June. Lincoln; Peru; Weeping Water; Crete; Fairbury.

612. HYDROPHYLLUM L. Water-leaf.

1569. *Hydrophyllum virginicum* L. Water-leaf. Woods; common. May. Weeping Water; Peru.

### 143. BORRAGINACEÆ. (BORAGE FAMILY.)

613. ECHIUM L.

1570. *Echium* VULGARE L. Blue-weed. Waste places; rare. June. Weeping Water; Lincoln.

614. LITHOSPERMUM L. Gromwell; puccoon.

1571 *Lithospermum angustifolium* Michx. (Includes *L. longiflorum* Spreng.) Long-flowered puccoon. Prairies; common. May. Lincoln; Fairbury; Peru; Crete; Valentine; Weeping Water; Beaver City.

1572. *Lithospermum canescens* (Michx.) Lehm. Hoary puccoon, or alkanet. Edges of woods; common. May. Weeping Water; Peru; Otoe county.

1573. *Lithospermum hirtum* Lehm. Hairy puccoon. Low prairies; common. May–June. Weeping Water; Antelope county; Pierce; Fremont; Anselmo.

615. ONOSMODIUM Michx. False gromwell.

1574. *Onosmodium carolinianum* DC. Banks and hillsides; not uncommon. June. Lincoln.

1575. *Onosmodium carolinianum* DC. var. *molle* Gray. Weeping Water. W.

616. MERTENSIA Roth.

1576. *Mertensia virginica* (L.) DC. "*Blue-bell.*" Virginia cowslip or lungwort. In damp woods; rare. May. Culbertson. U.

617. KRYNITZKIA Fisch. & Meyer. (*Eritrichium* Benth. & Hook.)

1577. *Krynitzkia crassisepala* (Torr. & Gray) Gray. Dry prairies. Belmont; Cherry county.

1578. *Krynitzkia glomerata* (DC.) Gray. Dry gulches and prairies, common. Crawford; Belmont.

618. ECHINOSPERMUM Swartz. Stickseed.

1579. *Echinospermum* LAPPULA (L.) Lehm. Roadsides and waste places; rather rare. Introduced. Lincoln; Weeping Water.

1580. *Echinospermum redowskii* Lehm. On prairies, common. May. Lincoln; Culbertson.

1581. *Echinospermum redowskii* Lehm. var. *cupulatum* Gray. Nebraska. (Coulter's Manual, p. 259.)

1582. *Echinospermum virginianum* (L.) B. S. P. (*Cynoglossum morisoni* DC.) Beggar's lice. Dakota county; Weeping Water. U.

619. HELIOTROPIUM L. Heliotrope.

1583. *Heliotropium curassavicum* L. Saline soil; banks of Grand Lake. Alliance, August 6.

1584. *Heliotropium convolvulaceum* Gray. Sandy places. Nebraska. (Coulter's Manual, p. 258.)

## 144. SOLANACEÆ. (NIGHTSHADE FAMILY.)

620. DATURA L. Jamestown-weed; thorn-apple.

1585. *Datura* STRAMONIUM L. Common stramonium, or thorn-apple. Waste places, common. July–August. Introduced. Lincoln; Weeping Water; Peru; Tecumseh (large patches).

621. LYCIUM L.

1586. *Lycium* VULGARE (Ait.) Dunal. Matrimony-vine. Escaped. May–June. Weeping Water; Lincoln.

622. PHYSALIS L. Ground cherry.

1587. *Physalis angulata* L. Cultivated grounds. Fairbury; Weeping Water. U.

1588. *Physalis lanceolata* Michx. (*P. pennsylvanica* of Gray's Manual.) Waste places, common. July. Lincoln; Weeping Water; Crete.

1589. *Physalis lanceolata* Michx. var. *lævigata* Gray. Nebraska. (Coulter's Manual, p. 270.)

1590. *Physalis pubescens* L. Fields, common. July–August. Lincoln; Peru; Weeping Water.

1591. *Physalis virginiana* Mill. (*P. viscosa* Gray, not L.) Waste places, yards, etc., common. June–July. Lincoln; Peru; Crete; Weeping Water.

1592. *Physalis virginiana* Mill. var. *ambigua* Gray. Long Pine. July. B.

623. SOLANUM L. Nightshade.

1593. *Solanum carolinense* L. Horse-nettle. Waste places; not uncommon. June–August. Lincoln; Peru; Weeping Water.

1594. *Solanum nigrum* L. Common nightshade. Shady places; common July–September. Lincoln; Fairbury; Weeping Water.

1595. *Solanum rostratum* Dunal. Buffalo bur. Waste places, roadsides, etc.; common. July–September. Lincoln; Oxford; Crete; Fairbury; Milford; Omaha; Louisville; Weeping Water; Alliance; Otoe county.

1596. *Solanum triflorum* Nutt. Prairies, not uncommon. West Point; Crete; Lincoln; Thedford. This usually inhabits places where the sod has been more or less distributed, as in and around prairie-dog towns.

## 145. SCROPHULARIACEÆ. (FIGWORT FAMILY.)

624. CASTILLEJA L. f. Painted cup.

1597. *Castilleja minor* Gray. Nebraska. (Coulter's Manual, p. 283.)

1598. *Castilleja sessiliflora* Pursh. Prairies; rare. May. Peru; Long Pine; Fort Robinson.

625. GERARDIA L. Gerardia.

1599. *Gerardia aspera* Dougl. Prairies, etc.; rare. Fairbury; Long Pine; Weeping Water; Nuckolls county. U.

1600. *Gerardia purpurea* L. Purple gerardia. Prairies; common. August–September. Lincoln; Peru; Crete; Seward county.

1601. *Gerardia tenuifolia* Vahl. Slender gerardia. Prairies; rare. July. Antelope county.

627. ORTHOCARPUS Nutt.

1602. *Orthocarpus luteus* Nutt. Prairies. Belmont, July 27; Hat Creek basin, August 1.

628. VERONICA L. Speedwell.

1603. *Veronica anagallis* L. Water speedwell. Wet places. Long Pine, May. U.

1604. *Veronica americana* Schw. Water speedwell. Edges of water. Belmont, July 6; Thedford, July 10; Dismal river in Thomas county, July 12; Hat Creek basin, August 1.

1605. *Veronica peregrina* L. Neckweed; purslane speedwell. Waste places; common. Lincoln, May.

1606. *Veronica virginica* L. Culver's root; Culver's physic. Waste places. July. Peru; Richardson county.

628½. SYNTHYRIS Benth.

1606½. *Synthyris rubra* (Hook.) Benth. Fort Robinson. May, 1890. (Collector, Rev. J. M. Bates.) U.

629. ILYSANTHES Raf. Pimpernel.

1607. *Ilysanthes gratioloides* (L.) Benth. False pimpernel. Low, wet grounds; common. June. Lincoln; Weeping Water.

630. HERPESTIS Gærtn. f. Herpestis.

1608. *Herpestis rotundifolia* Pursh. Ponds; rare. July. Lincoln.

631. MIMULUS L. Monkey flower.

1609. *Mimulus jamesii* Torr. & Gray. In wet places, common westward. May–July. Anselmo, July 6; Thedford, July 11; Alliance, August 6; Long Pine, May.

1610. *Mimulus ringens* L. Banks of creeks, rare. August. Lincoln.

632. PENTSTEMON Mitchell. Beard tongue.

1611. *Pentstemon albidus* Nutt. Nebraska. (Gray's Manual, p. 382.)

1612. *Pentstemon cæruleus* Nutt. Prairies. Antelope county; Hitchcock county; Long Pine; Valentine.

1613. *Pentstemon cobæa* Nutt. Prairies, common. June. Lincoln; Fairbury.

1614. *Pentstemon glaber* Pursh. Prairies, common. June–July. Lincoln; Peru; Crete; Fairbury; Alliance; Belmont.

1615. *Pentstemon grandiflorus* Nutt. Prairies, common. June–July. Lincoln; Peru; Anselmo.

1616. *Pentstemon gracilis* (Gray) Nutt. Prairies. August. Antelope county; Long Pine.

633. SCROPHULARIA L. Figwort.

1617. *Scrophularia nodosa* L. var. *marilandica* (L.) Gr. Damp woods, river banks, etc., common. July–August. Lincoln; Crete; Weeping Water; Belmont.

634. LINARIA Juss. Toad flax.

1618. *Linaria* VULGARIS Mill. Toad flax; butter-and-eggs; ramsted. Waste places, rare. Peru, June.

635. VERBASCUM L. Mullein.

1619. *Verbascum* THAPSUS L. Common mullein. Waste places, roadsides, etc. Peru; Milford; Lincoln; Weeping Water. (Nat. from Europe.)

### 146. ACANTHACEÆ. (ACANTHUS FAMILY.)

636. RUELLIA L. Ruellia.

1620. *Ruellia ciliosa* Pursh. Roadsides, not uncommon. August. Lincoln.

### 147. OROBANCHACEÆ. (BROOM-RAPE FAMILY.)

637. APHYLLON Mitchell. Cancer-root; naked broom-rape.

1621. *Aphyllon ludovicianum* Gray. Sandy prairies, common. Alliance, August 6; Thedford, August 7; Hat Creek basin, August 1; Belmont, July 25; Arapahoe.

1622. *Aphyllon uniflorum* (L.) Gray. One-flowered cancer-root. Damp woods and prairies, rare. May–June. Lincoln; Crete.

1622½. *Aphyllon fasciculatum* Gray. On roots of some *composite* (?). Alliance, August 6.

### 148. LENTIBULACEÆ. (BLADDERWORT FAMILY.)

638. UTRICULARIA L. Bladderwort.

1623. *Utricularia minor* L. Smaller bladderwort. In ponds, extending out of the water, somewhat on the wet bank; rare. Thedford, July 14.

1624. *Utricularia vulgaris* L. (Includes var. *americana* Gr.) Greater bladderwort. In ponds, not very common. July. Lincoln; Thedford.

### 149. LABIATÆ. (MINT FAMILY.)

639. TEUCRIUM L. Germander.

1625. *Teucrium canadense* L. American germander; wood sage. Roadsides and open woods; common. July–August. Lincoln; Weeping Water.

1626. *Teucrium occidentale* Gray. Prairies; common westward. Alliance; Weeping Water. Distinguished from the preceding by the character of the calyx—villous with viscid hairs, three upper lobes acute, or the middle one acuminate instead of very obtuse, as in *T. canadense.*

640. LEONURUS L. Motherwort.

1627. *Leonurus* CARDIACA L. Common motherwort. August. Weeping Water.

641. STACHYS L. Hedge-nettle.

1628. *Stachys aspera* Michx. (*S. palustris* L. var. *aspera* Gray.) Lincoln.

642. PHYSOSTEGIA Benth. False dragon-head.

1629. *Physostegia virginiana* (L.) Benth. Banks of streams; common. July–September. Lincoln; Peru.

643. BUNELLA L. Self-heal.

1630. *Bunella vulgaris* L. Common self-heal or heal-all. Wet wood banks, Richardson county, August 25; low wet prairies, Thedford, July 15;

644. SCUTELLARIA L. Skullcap.

1631. *Scutellaria lateriflora* L. Mad-dog skullcap. Wet, shaded places. common. July–September. Lincoln; Weeping Water; Louisville.

1632. *Scutellaria parvula* Michx. Little skullcap. Prairies and roadsides; not uncommon. May–June. Lincoln; Weeping Water.

1633. *Scutellaria resinosa* Torr. Nebraska. (Coulter's Manual, p. 298.)

645. NEPETA L. Cat-mint.

1634. *Nepeta* CATARIA L. Catnip. Woods, etc.; not yet common, but rapidly spreading. July. Lincoln; Weeping Water; Peru. (Introduced.)

1635. *Nepeta* HEDERACEA (L.) B. S. P. (*N. glechoma* Benth.) Gill. Ground ivy. Escaped. May. Peru; Richardson county.

646. LOPHANTHUS Benth. Giant hyssop.

1636. *Lophanthus anisatus* Benth. Nebraska. (Coulter's Manual, p. 298.)

1637. *Lophanthus nepetoides* (L.) Benth. Borders of woods; not uncommon. July. Weeping Water; Lincoln; Crete; Dakota county.

647. MONARDA L. Horse-mint.

1638. *Monarda citriodora* Cerv. Prairie bergamot. Prairies; common in central and western Nebraska. July–August. Broken Bow, July 4; Anselmo, July 6; Belmont, July 27; Hat Creek basin, August 2; Fort Robinson, July 29.

1639. *Monarda fistulosa* L. Wild bergamot. Banks of streams; common. July–August. Lincoln; Weeping Water; Peru; Otoe county; Belmont; Hat Creek basin.

648. SALVIA L. Sage.

1640. *Salvia azurea* Lam. Tall sage. Prairies, common. July. Lincoln; Crete; Fairbury; Weeping Water; Seward.

1641. *Salvia lanceolata* Willd. Roadsides, common. June–July. Lincoln; Peru; Alliance.

1642. *Salvia urticifolia* L. Nettle-leaved sage. Weeping Water. W.

649. HEDEOMA Pers. Mock pennyroyal.

1643. *Hedeoma drummondii* Benth. Dry prairies. July–August. Belmont, July 24; Cheyenne county, August.

1644. *Hedeoma hispida* Pursh. Low prairies, common. June–July. Lincoln; Crete; Fairbury; Weeping Water.

1645. *Hedeoma pulegioides* (L.) Pers. American pennyroyal. Woods. Richardson county, near Arago, August 23.

650. PYCNANTHEMUM Michx.

1646. *Pycnanthemum virginicum* (L.) B. S. P. (*P. lanceolatum* Pursh.) Mountain mint; basil. Hall county; Richardson county, August 24; Dismal river in Thomas county, July 13.

651. LYCOPUS L. Water horehound; bugle weed; gypsywort.

1647. *Lycopus lucidus* Turcz. var. *americanus* Gray. Low, wet prairies. Thedford, July 14. Very similar to *L. sinuatus* Ell., from which it is distinguished by its sessile, merely sharply, and irregularly serrate leaves with ascending teeth, instead of irregularly laciniate-pinnatifid or sinuate; conspicuous subulate outer bracts; and large tubers on the subterranean runners. Teeth of leaves usually about 2-3 millimetres long.

1648. *Lycopus sinuatus* Ell. (*L. europæus* L. var. *sinuatus*) Gray. Wet places common. July–August. Lincoln; Louisville; Weeping Water; Crete; Hat Creek basin; Thedford.

1649. *Lycopus virginicus* L. Bugle-weed. Damp woods, common. August. Lincoln; Louisville.

652. MENTHA L. Mint.

1650. *Mentha canadensis* L. Wild mint. Wet places, common. July–August. Lincoln; Weeping Water; Long Pine; Belmont, and Richardson county.

## 150. VERBENACEÆ. (VERVAIN FAMILY.)

653. VERBENA L. Vervain.

1651. *Verbena bipinnatifida* Nutt. Prairies, rare. July. Fort Robinson; Oxford; Broken Bow.

1652. *Verbena bracteosa* Michx. Prostrate vervain. Waste places, pastures, etc., common. June–August. Lincoln; Weeping Water; Oxford; Anselmo; Thedford; Hat Creek basin, and Saunders county.

1653. *Verbena hastata* L. Blue vervain. Waste places, pastures, etc., common. July–August. Lincoln; Peru; Weeping Water.

1654. *Verbena stricta* Vent. Hoary vervain. Prairies and waste places, common. June–August. Lincoln; Weeping Water, Peru; Crete; Fairbury; Anselmo.

1655. *Verbena urticæfolia* L. Nettle-leaved or white vervain. Pastures and waste places, common. July–September. Lincoln; Crete; Tecumseh; Weeping Water.

654. **Lippia** L. Lippia.

1656. *Lippia cuneifolia* Steud. Prairies, Phelps county.

655. **Phryma** L. Lopseed.

1657. *Phryma leptostachya* L. Woods, not uncommon. July. Lincoln; Crete; Long Pine; Louisville; Weeping Water; Anselmo; Belmont.

## 151. PLANTAGINACEÆ. (PLANTAIN FAMILY.)

656. **Plantago** L. Plantain; ribwort.

1658. *Plantago eriopoda* Torr. Sidney, May. U.

1659. *Plantago elongata* Pursh. (*P. pusilla* Nutt.) Low, barren prairies. Lincoln; Weeping Water; Anselmo.

1660. *Plantago major* L. Common plantain. Yards and waste places, wooded canons. Common. Lincoln; Peru; Weeping Water; Crete; Tecumseh; Belmont; Anselmo.

1661. *Plantago patagonica* Jacq. var. *gnaphalioides* Gray. Prairies, very common. July–September. Lincoln; McCook; Crete; Fairbury; Hardy; Wymore; Weeping Water; Anselmo; Thedford.

1662. *Plantago rugelii* Decaisne. Waste places, not uncommon. Lincoln. Commonly confounded with *P. major*.

## 152. OLEACEÆ. (OLIVE FAMILY.)

657. **Fraxinus** L. Ash.

1663. *Fraxinus pubescens* Lam. Red ash. Long Pine; Valentine. B.

1664. *Fraxinus viridis* Michx. Green ash. Banks of streams, wooded canons, common. Lincoln; Crete; Peru; Long Pine; Weeping Water; Brownville; Tecumseh; Anselmo; Belmont, and Dismal river.

1665. *Fraxinus americana.?* L. White ash. Nebraska. (Gray's Manual, p. 335.)

## 153. GENTIANACEÆ. (GENTIAN FAMILY.)

658. **Gentiana** L. Gentian.

1666. *Gentiana calycosa* Griseb. Prairies, common. September–October. Lincoln; Peru; Weeping Water; Crete; Long Pine; and Antelope county.

1667. *Gentiana puberula* Michx. Weeping Water. W.

659. **Eustoma** Salisb.

1668. *Eustoma russellianum* Griseb. Low prairies. Antelope county; Kearney county; Lincoln county; Alliance.

## 154. APOCYNACEÆ. (DOGBANE FAMILY.)

660. **Apocynum** L. Dogbane; Indian hemp.

1669. *Apocynum androsæmifolium* L. Spreading dogbane. Roadsides and rocky ridges. July. Cass county; Belmont.

1670. *Apocynum cannabinum* L. Indian hemp. Roadsides and waste places, very common. July–September. Lincoln; Crete; Brownville; Weeping Water; Anselmo; Belmont; and Dakota county.

## 155. ASCLEPIADACEÆ. (MILKWEED FAMILY.)

661. **Asclepias** L. Milkweed; silkweed.

1671. *Asclepias arenaria* Torr. Prairies, common westward. Long Pine; Belmont; and Dismal river, Thomas county.

1672. *Asclepias incarnata* L. Swamp milkweed. Wet places, banks of streams, common. July–August. Lincoln; Weeping Water; Long Pine; Anselmo.

1673. *Asclepias obtusifolia* Michx. Weeping Water. W.

1674. *Asclepias ovalifolia* Decaisne. Dwarf milkweed. Weeping Water. W.

1675. *Asclepias purpurascens* L. Purple milkweed. Weeping Water. W.

1676. *Asclepias speciosa* Torr. Prairies, not uncommon westward. Anselmo, July 6; Thedford, July 18.

1677. *Asclepias stenophylla* Gray. Nebraska. (Coulter's Manual, p. 241.)

1678. *Asclepias sullivantii* Engelm. Low grounds. Weeping Water; Lincoln.

1679. *Asclepias syriaca* L. (*A. cornuti* Decaisne.) Common milk weed. Everywhere a common weed. August–October. Lincoln; Peru; Crete; Tecumseh; Wymore; Weeping Water; Anselmo.

1680. *Asclepias tuberosa* L. Butterfly weed; pleurisy root. Waste places and prairies, common. July–August. Lincoln; Crete; Weeping Water; Humboldt; Fairbury; Dakota county; Douglas county.

1681. *Asclepias verticillata* L. Whorled milkweed. Prairies and waste places, common. July–August. Lincoln; Peru; Weeping Water; Fairbury.

1682. *Asclepias verticillata* L. var. *pumila* Gray. Prairies; common. McCook; Fort Robinson; Valentine; Anselmo; Belmont; Crawford; Broken Bow; Thedford.

662. ACERATES Ell. Green milkweed.

1683. *Acerates lanuginosa* Decaisne. Prairies. Antelope county; Crete.

1684. *Acerates longifolia* Ell. Prairies and roadsides; common. Lincoln; Peru; Hastings; Crete; Weeping Water; Broken Bow; Anselmo.

1685. *Acerates viridiflora* (Raf.) Ell. Prairies; common. June–September. Lincoln; Weeping Water.

## 156. CAMPANULACEÆ. (CAMPANULA FAMILY.)

663. LOBELIA L. Lobelia.

1686. *Lobelia spicata* Lam. Lobelia. Low prairies; rather uncommon. Broken Bow, July 4; Clearwater.

1687. *Lobelia syphilitica* L. Great lobelia. Wet banks of streams; common. July–September. Lincoln; Long Pine; Peru; Weeping Water; Crawford.

664. CAMPANULA L. Bellflower.

1688. *Campanula americana* L. Tall bellflower. Woods. August–September. Lincoln; Peru; Weeping Water; Otoe county; Richardson county.

1689. *Campanula aparinoides* Pursh. Marsh bellflower. Wet prairies; rare. July. Lincoln; Long Pine.

1689½. *Campanula rotundifolia* L. Harebell. Rocky bluffs; common. July–August. Belmont; Hat Creek basin; Valentine.

665. SPECULARIA Heister. Venus' looking-glass.

1690. *Specularia perfoliata* (L.) A. DC. Prairies and waste places; common. July. Lincoln; Crete; Fairbury; Weeping Water; Thedford; Broken Bow.

## 157. CUCURBITACEÆ. (GOURD FAMILY.)

666. SICYOS L.

1691. *Sicyos angulatus* L. One-seeded star cucumber. River banks; not very common. Lincoln.

667. ECHINOCYSTIS Torr. & Gray.

1692. *Echinocystis echinata* (Muhl.) B. S. P. (*E. lobata* Torr & Gr.) Wild cucumber. Copses; common. August. Lincoln; Crete; Weeping Water; Tecumseh.

668. CUCURBITA L. Pumpkin; squash.

1693. *Cucurbita fœtidissima* H. B. K. (*Cucurbita perennis* Gray.) Wild pumpkin. Prairies; rare. Lincoln county. U. Root very large. Specimens have been brought to the herbarium of the university measuring 1½ metres (5 ft.) in length and about 25 cm. (10 in.) in thickness. In shape they are fusiform, like the root of the garden beet.

### 158. RUBIACEÆ. (MADDER FAMILY.)

669. GALIUM L. Bedstraw; cleavers.

1694. *Galium aparine* L. Cleavers; goose grass. Rich woods, common. Lincoln; Weeping Water; Crete; Anselmo; Hat Creek basin.

1695. *Galium asprellum* Michx. Rough bed straw. Woods. Weeping Water. W.

1696. *Galium bifolium* Watson. Weeping Water; Louisville. W.

1697. *Galium boreale* L. Northern bedstraw. High rocky ridges. Belmont; Hat Creek basin.

1698. *Galium circæzans* Michx. Wild liquorice. Damp woods. July. Lincoln; Louisville; Crete.

1699. *Galium concinnum* Torr. & Gray. Small bedstraw. Dry woods. Weeping Water.

1700. *Galium trifidum* L. Small bedstraw. Wet woods. Weeping Water.

1701. *Galium tridfium* L. var. *pusillum* Gray. Weeping Water. W.

1702. *Galium trifidum* L. var. *latifolium* Torr. Weeping Water. W.

1703. *Galium triflorum* Michx. Sweet scented bedstraw. Rich woods, common. July–August. Weeping Water; Long Pine; Lincoln.

670. HOUSTONIA L. Houstonia.

1704. *Houstonia angustifolia* Michx. Banks. Cass county. S.

671. CEPHALANTHUS L.

1705. *Cephalanthus occidentalis* L. Button rush. Along streams. West Point.

### 159. CAPRIFOLIACEÆ. (HONEYSUCKLE FAMILY.)

672. LONICERA L. Honeysuckle; woodbine.

1706. *Lonicera flava* Sims. Yellow honeysuckle. Woods. May. Peru.

1707. *Lonicera glauca* Hill. (*L. parviflora* Lam.) Small honeysuckle. Woods. May. Peru.

1708. *Lonicera sempervirens* L. Trumpet; honeysuckle. Banks of the Missouri river; Cass county. W.

673. SYMPHORICARPOS Juss. Snowberry.

1709. *Symphoricarpos occidentalis* Hook. Wolf-berry. Banks of streams, common. July. Lincoln; Crete; Long Pine; Weeping Water; Anselmo; Thedford.

1710. *Symphoricarpos racemosus* Michx. var. *pauciflorus* Robbins. High, rocky places. Hat Creek basin, August 1, 1889.

1711. *Symphoricarpos vulgaris* Michx. Indian currant; coral berry. In woods and on bank of streams, common. August. Lincoln; Tecumseh; Weeping Water.

674. TRIOSTEUM L. Fever-wort; horse-gentian.

1712. *Triosteum perfoliatum* L. Fever-wort. Edges of woods, not very common. June. Weeping Water; Lincoln; Peru; Crete.

675. VIBURNUM L. Arrow-wood.

1713. *Viburnum lentago* L. Sweet viburnum; sheep-berry. Along wooded banks of streams. May. Plattsmouth.

676. SAMBUCUS L. Elder.

1714. *Sambucus canadensis* L. Open places, etc., common. June-July. Lincoln; Table Rock; Tecumseh; Weeping Water.

## 160. COMPOSITÆ. (COMPOSITE FAMILY.)

677. STEPHANOMERIA Nutt.

1715. *Stephanomeria runcinata* Nutt. Nebraska. (Coulter's Manual.)

678. TRAGOPOGON L.

1716. *Tragopogon* PORRIFOLIUS L. Vegetable oyster. Roadsides, etc., not uncommon. Lincoln. Introduced.

679. LYGODESMIA Don.

1717. *Lygodesmia juncea* Don. Prairies, common. Cheyenne county; Butler county; Fort Robinson; Thedford; Anselmo; Belmont.

1718. *Lygodesmia rostrata* Gray. Sandy prairies. Thedford, July 14; Valentine.

680. SONCHUS L. Sow-thistle.

1719. *Sonchus* ASPER Vill. Waste places. Introduced. Lincoln; Weeping Water.

681. PRENANTHES L. (Includes *Nabalus* Cass.) Rattlesnake root.

1720. *Prenanthes asper* Torr. & Gr. Roadsides, not uncommon. August. Lincoln; Crete; Seward county.

682. LACTUCA L. (Includes *Mulgedium.*) Lettuce.

1721. *Lactuca canadensis* L. Wild lettuce. Waste places, etc., fields, thickets, common. Lincoln; Weeping Water.

1722. *Lactuca villosa* (Jacq.) B. S. P. (*M. acuminatum* DC.) Bottom lands. August. Lincoln.

1723. *Lactuca floridana* (L.) Gærtn. Waste places, roadsides, etc. August. Lincoln; Hastings; Weeping Water.

1724. *Lactuca ludoviciana* DC. Weeping Water. W.

1725. *Lactuca pulchella* (Nutt.) DC. Waste places, common. July. Lincoln; Fairbury; Long Pine; Weeping Water; Belmont; Hat Creek basin.

683. TARAXACUM Hall. Dandelion.

1726. *Taraxacum officinale* Web. (*T. dens-leonis* Desf.) Common dandelion. Meadows and yards, common. May. Lincoln; Peru; Crete; Weeping Water.

684. TROXIMON Nutt. False dandelion.

1727. *Troximon cuspidatum* Pursh. Prairies, not rare. May. Lincoln; Peru; Crete; Valentine; Weeping Water; Beaver City.

1728. *Troximon glaucum* (Eaton) Nutt. var. *parviflorum* (Nutt.) Gray. Nebraska. (Coulter's Manual, p. 221.)

685. MALACOTHRIX DC.

1729. *Malacothrix sonchoides* Torr. & Gr. West Nebraska. (Coulter's Manual, p. 216.)

686. HIERACIUM L. Hawkweed.

1730. *Hieracium longipilum* Torr. Nebraska. (Coulter's Manual, p. 217.)

1731. *Hieracium scabrum* Michx. Rough hawkweed. Hillsides. September. Lincoln. S.

1732. *Hieracium venosum* L. Rattlesnake-weed. Rare, in dry waste places. Lincoln. P.

687. CNICUS L. (*Cirsium* DC.) Thistle.

1733. *Cnicus altissimus* (L.) Willd. Common thistle. Waste places, common. September. Lincoln; Peru; Weeping Water.

1734. *Cnicus altissimus* (L.) Willd. var. *discolor* (Muhl.) Gray. (*C. discolor* Spreng.) Common thistle. Waste places, common. August. Lincoln.

1735. *Cnicus* ARVENSIS (L.) Hoff. Creeping or "Canada" thistle. Lincoln. U.

1736. *Cnicus* LANCEOLATUS (L.) Hoff. Weeping Water. W.

1737. *Cnicus ochrocentrus* Gray. Prairies. July. Long Pine. B.

1738. *Cnicus pitcheri* Torr. Prairies. July. Antelope county,

1739. *Cnicus undulatus* Gray. Prairies, roadsides, etc. Hastings, August 2.

688. ARCTIUM L.

1740. *Arctium* LAPPA L. (*Lappa officinalis* All.) Burdock. Waste places, yet rare. Introduced. Lincoln; Weeping Water.

1741. *Arctium* LAPPA L. var. MINUS (Schkuhr.) Gray. Peru, September.

689. CACALIA L. Indian plantain. (Placed under *Senecio* by Benth. and Hook.)

1742. *Cacalia atriplicifolia* L. Pale Indian plantain. Common along the Missouri river bluffs. July–August. Richardson county; Nebraska City.

1743. *Cacalia tuberosa* Nutt. Tuberous Indian plantain. Prairies, common. July–August. Lincoln; Crete; Weeping Water.

690. SENECIO L. Groundsel.

1744. *Senecio aureus* L. Golden ragwort. Prairies, common. May. Lincoln; Peru; Crete; Weeping Water; Fairbury.

1745. *Senecio aureus* L. var. *balsamitæ* (Muhl.) Torr. & Gr. Prairies. July. Valley county.

1746. *Senecio aureus* L. var. *compactus* Gray. Prairies. May. Valentine. U.

1746½. *Senecio canus* Hook. Fort Robinson, May, 1890. (Collected by Rev. J. M. Bates.) U.

1747. *Senecio douglasii* DC. (*S. longilobus* Benth.) Ragwort. Roadsides, and high prairies. July–August. Lincoln; Fort Robinson; Crawford; Alliance.

1748. *Senecio integerrimus* Nutt. Ragwort. High prairies. May. Lincoln.

1449. *Senecio lugens* Richards. Ragwort. Prairies, rare. May. Lincoln.

691. ERECHTITES Raf.

1750. *Erechtites hieracifolia* (L.) Raf. Fireweed. Banks of streams, rare. August. Lincoln.

692. ARTEMISIA L. Wormwood; sage brush.

1751. *Artemisia biennis* Willd. Biennial wormwood. Lincoln, August 16.

1752. *Artemisia canadensis* Michx. Wild wormwood. High rocky ridges. Hat Creek basin, August 2.

1753. *Artemisia cana* Pursh. High prairies, not uncommon. Hat Creek basin; Crawford.

1754. *Artemisia dracunculoides* Pursh. Wormwood. River banks, common. August–September. Lincoln; Weeping Water.

1755. *Artemisia filifolia* Torr. Wormwood. Prairies, common. Box Butte county; Fort Robinson.

1756. *Artemisia frigida* Willd. Wild sage. Prairies. July–September.

Box Butte county; Long Pine; Fort Robinson; Belmont; Hat Creek basin.

1757. *Artemisia longifolia* Nutt. Prairies. July. Chadron. B.

1758. *Artemisia ludoviciana* Nutt. Wormwood; western mugwort. Prairies, very common. Lincoln; Long Pine; Weeping Water; Anselmo.

1759. *Artemisia tridentata* Nutt. Sage brush; sage wood; mountain sage. Common on very high prairies and rocky banks, in "bad lands." Hat Creek basin, August 1.

693 CHRYSANTHEMUM L.

1760. *Chrysanthemum* LEUCANTHEMUM L. (*Leucanthemum vulgare* Lam.) Ox-eye; daisy or whiteweed. Lincoln.

694. ANTHEMIS L. Chamomile.

1761. *Anthemis* ARVENSIS L. Corn chamomile. Introduced. Weeping Water. W.

1762. *Anthemis* COTULA L. (*Maruta cotula* DC.) Common Mayweed. Introduced. Waste places; common. May–July. Lincoln; McCook; Thedford.

695. ACHILLEA L. Yarrow.

1763. *Achillea millefolium* L. Prairies; common. May–July. Lincoln; Fairbury; Peru; Weeping Water; Hat Creek basin.

696. CREPIS L.

1764. *Crepis glauca* Torr. & Gr. Nebraska. (Coulter's Manual, p. 219.)

1765. *Crepis occidentalis* Nutt. Prairies. Nebraska. (Coulter's Manual; p. 219.)

697. ACTINELLA Nutt.

1766. *Actinella acaulis* (Pursh.) Nutt. On dry, rather stony and barren hills, common. June–August. Harrison; Belmont; Hat Creek basin. Altitude 4,600–5,200 feet. Leaves not punctate as in *A. scaposa*; pappus of 5–7 scales instead of 5, and whole plant more densely canescent.

698. DYSODIA Cav. Fetid marigold.

1767. *Dysodia chrysanthemoides* Lag. Waste places, roadsides; very common. July–August. Lincoln; Crete; Tecumseh; Weeping Water.

699. POLYPTERIS Nutt.

1768. *Polypteris hookeriana* Gray. Nebraska. (Coulter's Manual, p. 194.)

700. BAHIA Lag.

1769. *Bahia oppositifolia* Nutt. Dry prairies. Hat Creek basin, August 2.

701. HYMENOPAPPUS L'Her.

1770. *Hymenopappus corymbosus* T. & G. Nebraska. (Gray's Manual, p. 286.)

1771. *Hymenopappus filifolius* Hook. Prairies; common. Antelope county; Fort Robinson; Belmont.

1772. *Hymenopappus tenuifolius* Pursh. Open prairies. May. Fairbury. U.

702. BIDENS L. Bur marigold.

1773. *Bidens bipinnata* L. "Spanish needles." Weeping Water. W.

1774. *Bidens cernua* L. Smaller bur marigold. Banks of streams; not very common. August–September. Roca.

1775. *Bidens connata* Muhl. Swamp beggar-ticks. Weeping Water. W.

1776. *Bidens frondosa* L. Common beggar-ticks. Waste places; common. August. Lincoln; Seward county.

1777. *Bidens lævis* (L.) B. S. P. (*B. chrysanthemoides* Michx.) Wet grounds. September. Lincoln.

703. THELESPERMA Less.

1778. *Thelesperma gracile* Gray. Prairies; rare. Fairbury, June; Dismal river in Thomas county, July 13.

704. COREOPSIS L. Tickseed.

1779. *Coreopsis palmata* Nutt. Prairies and waste places. Richardson county; Weeping Water.

1780. *Coreopsis tinctoria* Nutt. Prairies, common. July. Lincoln; Hastings; Nebraska City; Aurora.

1781. *Coreopsis verticillata* L. High prairies, not uncommon. July–August. Fillmore county; Weeping Water; Alliance; Crawford.

705. ACTINOMERIS Nutt.

1782. *Actinomeris alternifolia* (L.) DC. (*A. squarrosa* Nutt.) Woods, common. August. Lincoln; Weeping Water.

706. HELIANTHUS L. Sunflower.

1783. *Helianthus annuus* L. Common sunflower. Waste places, very common. August–October. Lincoln; Oxford; Crete; Tecumseh; Brownville; Long Pine; Weeping Water.

1784. *Helianthus hirsutus* Raf. Weeping Water. W.

1785. *Helianthus divaricatus* L. Weeping Water. W.

1786. *Helianthus giganteus* L. Roadsides. August. Lincoln.

1787. *Helianthus grosse-serratus* Martens. Roadsides and waste places, common. September. Crete; Tecumseh; Weeping Water.

1788. *Helianthus lætiflorus* Pers. Prairies, and waste places, not uncommon. September. Lincoln, and Antelope county.

1789. *Helianthus maximiliani* Schrader. Waste places, common. August. Lincoln; Long Pine; Hastings; Weeping Water.

1790. *Helianthus orgyalis* DC. Dry prairies. Nebraska. (Coulter's Manual, p. 186.)

1791. *Helianthus petiolaris* Nutt. Prairies, common. July–August. Dismal river, in Thomas county; Belmont; Broken Bow; Hat Creek basin.

1792. *Helianthus petiolaris* Nutt. var. *canescens* Gray. Nebraska. (Gray, Syn. Fl. of N. A., vol. I, part 2, p. 272.)

1793. *Helianthus rigidus* Desf. Prairies, common. August–October. Lincoln; Weeping Water; Crete.

1794. *Helianthus tuberosus* L. (Includes *H. doronicoides* T. & G., not Lam.) Roadsides, waste places, etc. Wymore; Weeping Water.

707. LEPACHYS Raf. Cone-flower.

1795. *Lepachys pinnata* Torr. & Gr. Dry prairies and waste places. July. Peru; Weeping Water.

1796. *Lepachys columnaris* (Pursh.) Torr. & Gr. Prairies, common. July–September. Lincoln; Arapahoe; Fairbury; Hastings; Belmont; Anselmo.

1797. *Lepachys columnaris* (Pursh.) Torr. & Gr. var. *pulcherrima* (DC.) Torr. & Gr. Prairies, etc. July. Antelope county; Arapahoe; Belmont.

708. RUDBECKIA L. Cone-flower.

1798. *Rudbeckia hirta* L. Prairies, not uncommon. Lincoln; Aurora; Thedford; Belmont.

1799. *Rudbeckia laciniata* L. Open woods, common. August. Lincoln; Weeping Water.

709. ECHINACEA Mœnch. Purple cone-flower.

1800. *Echinacea angustifolia* DC. Purple cone-flower. "Nigger-head." Prairies, common. August–October. Crete; Weeping Water; Lincoln; Anselmo.

710. HELIOPSIS Pers. Ox-eye.

1801. *Heliopsis scabra* Dunal. Prairies, common. July–August. Lincoln; Weeping Water; Peru.

711. XANTHIUM L.

1802. *Xanthium canadense* Mill. Cockle-bur. Fields and waste places, too common. July–Sept. Lincoln; Crete.

1803. *Xanthium* STRUMARIUM L. Cockle-bur. Introduced. Weeping Water. W.

712. FRANSERIA Cav.

1804. *Franseria discolor* Nutt. Nebraska. (Coulter's Manual, p. 181.)

713. AMBROSIA L. Ragweed.

1805. *Ambrosia artemisiæfolia* L. Roman wormwood; hog-weed; bitter-weed. Waste places, common. September. Lincoln; Tecumseh; Weeping Water.

1806. *Ambrosia psilostachya* DC. Roadsides, etc., rare. Lincoln; Crete; Weeping Water.

1807. *Ambrosia trifida* L. Great ragweed. Too common in waste and cultivated fields. August–September. Lincoln; Crete; Tecumseh; Weeping Water.

714. IVA L. Marsh elder; highwater shrub.

1808. *Iva ciliata* Willd. Roadsides, common. Lincoln.

1809. *Iva xanthiifolia* Nutt. Waste places, not uncommon. September. Lincoln.

715. SILPHIUM L. Rosin-weed.

1810. *Silphium integrifolium* Michx. Rosin-weed. July–August. Lincoln; Weeping Water; Crete.

1811. *Silphium laciniatum* L. Compass plant; rosin-weed. Low prairies, common. August–October. Lincoln; Peru; Eagle; Weeping Water.

1812. *Silphium perfoliatum* L. Cup-plant. River banks, common. July–September. Lincoln; Peru; Tecumseh; Weeping Water.

1813. *Silphium trifoliatum* L. Weeping Water. W.

715½. GNAPHALIUM L.

1813½. *Gnaphalium palustre* Nutt. Low banks of the Platte river. Camp Clarke, Cheyenne county, August 26, 1889. (J. G. Smith.) U.

716. ANTENNARIA Gærtn. Everlasting.

1814. *Antennaria plantaginifolia* (L.) Hook. Everlasting; ladies' tobacco. Lincoln; Peru; Fairbury; Crete; Weeping Water.

717. ERIGERON L. Fleabane.

1815. *Erigeron annuus* (L.) Pers. Daisy fleabane; sweet scabiosa. Weeping Water; Louisville.

1816. *Erigeron bellidiastrum* Nutt. Roadsides in canons, rare. Hat Creek Creek basin, August 1.

1817. *Erigeron canadensis* L. Horseweed, or butterweed. Waste places, common. August–October. Lincoln; Weeping Water; Crete; Long Pine.

1818. *Erigeron divaricatus* Michx. Dwarf fleabane. Waste places, common. July–September. Lincoln; Weeping Water; Thedford.

1819. *Erigeron divergens* Torr. & Gr. Hitchcock county; Cheyenne county; Belmont.

1820. *Erigeron philadelphicus* L. Common fleabane. Peru; Weeping Water; Long Pine; Anselmo.

1821. *Erigeron ramosus* (Walt.) B. S. P. (*E. strigosus* Muhl.) Daisy fleabane. Prairies, very common. Lincoln; Weeping Water.

718. ASTER L. Aster.

1822. *Aster angustus* Torr. & Gr. Low prairies, rather common. Lincoln.

1823. *Aster canescens* Pursh. High prairies. Hat Creek basin, Sioux county, August 1, 1889.

1824. *Aster commutatus* Torr. & Gray. Fairbury; Belmont, July 24.

1825. *Aster cordifolius* L. Weeping Water. W.

1826. *Aster drummondii* Lindl. Weeping Water. W.

1827. *Aster lævis* L. (Including *A. cyaneus* Hoffm. and *A. lævigatus* Hook.) Weeping Water; Lincoln.

1828. *Aster macrophyllus* L. Wooded banks, common. August–September. Lincoln; Peru.

1829. *Aster multiflorus* Ait. Roadsides, etc., common. Lincoln; Weeping Water; Geneva; Hastings; Long Pine.

1830. *Aster novæ-angliæ* L. New England aster. Peru. September.

1830½. *Aster novi-belgii* L. (*A. longifolius* of Gray's Manual, fifth edition.) Weeping Water. W.

1831. *Aster oblongifolius* Nutt. Prairies, common. Lincoln; Fairbury; Weeping Water; Antelope county.

1832. *Aster patens* Ait. Prairies. August. Antelope county.

1833. *Aster sagittifolius* Willd. Dry grounds. August. Lincoln; Weeping Water.

1834. *Aster salicifolius* Ait. (Includes *A. carneus* Nees. in part.) Long Pine; Weeping Water. B.

1835. *Aster sericeus* Vent. Dry prairies, common. October. Lincoln; Peru; Weeping Water.

1836. *Aster tanacetifolius* (Nees.) H. B. K. Nebraska. (Coulter's Manual, p. 168.)

1837. *Aster turbinellus* Lindl. Weeping Water. W.

1838. *Aster undulatus* L. Lincoln. P.

719. BOLTONIA L'Her.

1839. *Boltonia glastifolia* L'Her. Low places, common. Lincoln; Weeping Water.

1840. *Boltonia asteroides* L'Her. Weeping Water. W.

720. TOWNSENDIA Hook.

1841. *Townsendia grandiflora* Nutt. Prairies and high rocky ridges, common. Antelope county; Hitchcock county; Fort Robinson; North Platte; Belmont; Hat Creek basin.

721. SOLIDAGO L. Golden rod.

1842. *Solidago arguta* Ait. River banks, common. July–September. Lincoln; Peru; Crete; Tecumseh; Weeping Water.

1843. *Solidago canadensis* L. Our most common golden rod. Everywhere. July–October. Peru; Lincoln; Seward county; Hastings; Weeping Water; Tecumseh.

1844. *Solidago canadensis* L. var. *scabra* (Muhl.) Torr. & Gr. Fairbury, September. U.

1845. *Solidago caroliniana* (L.) B. S. P. (*S. tenuifolia* Pursh.) Prairies, common. Lincoln; Long Pine.

1846. *Solidago humilis* Pursh. Prairies, September. Lincoln.

1847. *Solidago lanceolata* L. Prairies. Weeping Water; Lincoln. W. & P.

1848. *Solidago missouriensis* Nutt. Weeping Water. W.

1849. *Solidago missouriensis* Nutt. var. *montana* Gr. Highlands, etc. July. Fort Robinson. U.

1850. *Solidago nemoralis* Ait. High prairies. July–August. Lincoln; Weeping Water.

1851. *Solidago rigida* L. Prairies, very common. August–September. Lincoln; Peru; Weeping Water; Crete; Long Pine; Tecumseh.

1852. *Solidago rupestris* Raf. Prairies, common. July–September. Lincoln; Weeping Water, and Dismal river in Thomas county.

1853. *Solidago serotina* Ait. Fort Robinson, B.; Weeping Water, W.

1854. *Solidago speciosa* Nutt. var. *angustata* Torr. & Gr. Weeping Water. W.

1855. *Solidago speciosa* Nutt. var. *rigidiuscula* Torr. & Gr. Low prairies. September. Lincoln; Crete.

1856. *Solidago ulmifolia* Muhl. Woods, etc. Richardson county, August 25. (Disagrees in having smooth achenes.)

722. BIGELOVIA DC. Rayless golden rod.

1857. *Bigelovia graveolens* Gray. Barren, denuded places, banks, etc. Hat Creek basin, August 2.

723. HAPLOPAPPUS Cass.

1858. *Haplopappus spinulosus* DC. Prairies. June–July. Fairbury; Cambridge; Hardy; Kearney; Antelope county; Anselmo; Thedford; Belmont.

724. CHRYSOPSIS Nutt. Golden aster.

1859. *Chrysopsis villosa* (Pursh.) Nutt. Prairies, common. Dismal river in Thomas county, July 13; Alliance, July 15; Belmont, July 25.

725. GRINDELIA Willd. Gum plant.

1860. *Grindelia squarrosa* Dunal. Fetid gum plant. Roadsides, etc.; very common. September-October. Lincoln; Weeping Water; Belmont.

726. GUTIERREZIA Lag.

1861. *Gutierrezia euthamiæ* Torr. & Gr. Prairies; common. Belmont, July 27; Hat Creek basin, August 1.

727. LIATRIS Schreb. Blazing star.

1862. *Liatris punctata* Hook. Prairies; common. August–September. Peru; Crete; Lincoln; Fairbury; Fort Robinson; Weeping Water; Polk county; Seward county; Thedford; Anselmo.

1863. *Liatris pycnostachya* Michx. Prairies, etc. August. Lincoln; Dakota county. (Frequently confounded with *L. spicata*.)

1864. *Liatris scariosa* (L.). Willd. Prairies; common. August–September. Lincoln; Crete; Weeping Water; Seward.

1865. *Liatris squarrosa* Willd. Prairies. September. Polk county.

728. KUHNIA L.

1866. *Kuhnia eupatorioides* L. Prairies; common. August–September. Lincoln; Weeping Water; Long Pine; Peru; Crete; Seward; Belmont.

1867. *Kuhnia eupatorioides* L. var. *corymbulosa* Torr & Gray. Nebraska. (Coulter's Manual, p. 143.)

729. EUPATORIUM L. Thoroughwort.

1868. *Eupatorium ageratoides* L. White snakeroot. Woods; common. July–August. Peru; Crete; Lincoln; Seward; Weeping Water; Dakota county.

1869. *Eupatorium altissimum* L. Thoroughwort. Waste places; not common. August. Lincoln.

1870. *Eupatorium perfoliatum* L. Boneset. Pastures, low prairies, etc. July–August. Plattsmouth; Thedford; Anselmo.

1871. *Eupatorium purpureum* L. Joe-Pye weed. Waste places, woods, etc. common. Dakota county; Antelope county; Thomas county; Anselmo; Richardson county. July–September.

730. VERNONIA Schreb. Iron weed.

1872. *Vernonia fasciculata* Michx. Iron weed. Low prairies and waste places; very common. Lincoln; Peru; Crete; Long Pine; Nebraska City; Hastings; Tecumseh; Weeping Water.

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NOTE.—Eighteen species not indicated in the above numbering have been inserted under their respective genera as half numbers in preference to adding them as an appendix.

[By a slip of the pen, ten numbers in Anthophyta were duplicated in the manuscript. These were corrected in proof reading, thus making the final number 1872 instead of 1862. Adding the interpolated species, the number of Anthophytes is 982, and the whole number of plants in the catalogue 1890.—PROOF READER.]

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# SUGAR BEET INDUSTRY IN NEBRASKA.

The sugar beet industry in Nebraska has, of late, reached such magnitude and is of such importance that the editor of this volume in compiling gives place to the entire Bulletin No. 13 of the Agricultural Experiment Station of Nebraska. This is the detailed valuable work of H. H. Nicholson, A. M., and Rachel Lloyd, Ph. D.

The importance of the sugar industry to the United States in general, and in particular to those sections where the conditions are favorable to its successful development, is a subject of wide-spread interest. This fact, taken in connection with our desire to place before the farmers of Nebraska some statements in regard to the possibilities in the cultivation of beets for the production of sugar, has been the leading motive in determining the statistics herein presented.

Previous to this time no systematic attempt has been made to determine, experimentally, whether or not beets can be raised successfully in this state for sugar manufacture. In 1872,* beets raised on the Industrial College farm, for stock feeding, were analyzed and found to yield over fifteen per cent of sugar. Nothing further has been done in Nebraska, so far as we can ascertain, until the spring of 1888, when the people in and around Grand Island made a systematic attempt to demonstrate, experimentally, that beets could be raised in that locality of sufficient richness in sugar to warrant the investment of capital in a sugar plant at that place. In order that there should be no doubt as to the actual sugar content of these beets, samples were sent for analysis to various laboratories in this country and in Europe. The samples sent to this laboratory were analyzed by Prof. Lloyd, who, at the request of the Hon. Robert W. Furnas, secretary of the State Board of Agriculture, read a paper before that body January, 1888,† giving a summary of the various analyses made prior to that date.

The results of the Grand Island experiment in raising sugar beets were so satisfactory that we determined to try and extend the work of experimentation throughout the entire state during the season of 1889. By asking the co-operation of the farmers in collecting reliable information concerning the amount of ground planted, kind of seed sown, cultivation given, etc., we hoped to gain valuable facts to aid in solving the problem before us. To this end the following circular was published in the state papers and sent to individuals early in March, 1889 :

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*See Report of State Board of Agriculture, 1873, page 121.

†Annual Report State Board of Agriculture, 1888, p. 80.

CHEMICAL LABORATORY,
UNIVERSITY OF NEBRASKA.
POSTOFFICE Box 675.

LINCOLN, NEB., March, 1889.

*To the Farmers of Nebraska:* Inasmuch as the sugar industry bids fair to become in the near future very prominent in our state, we ask your co-operation in the collecting and distributing of reliable information in regard to it.

If you plant this season either sugar beet or sugar cane seed, will you kindly note the facts in season and answer the following questions?

1. Kind and variety of seed planted..........................
   (*a*) Sugar beet..........................
   (*b*) Sugar cane..........................
2. Number of acres planted..........................
3. Date of planting..........................
4. Kind of soil..........................
5. Method of cultivation..........................
6. Time of harvesting.......................... Yield per acre..........................
7. Cost per acre.......................... Price per ton at factory..........................
8. Kind of season..........................

Samples of beets and answers to these questions should be sent to Prof. Rachel Lloyd or myself as early as November 1, 1889, as we intend to publish for the benefit of the public the information thus obtained, together with our analyses of the beets raised in different portions of the state.

Very respectfully,
H. H. NICHOLSON,
*Director of the Laboratory.*

By courtesy of the Department of Agriculture at Washington, D. C., we received in April, 1889, a small amount of two varieties of sugar beet seed, *i. e.*, Lane's Imperial and Vilmorin. This seed was distributed among the farmers in different sections of the state. In May, 1889, the Hon. John Jenkins, deputy commissioner of labor and statistics, informed us that the Bureau of Labor and Statistics had undertaken the work of collecting reliable data concerning the sugar industry in the state. Mr. Jenkins asked us to make the analyses of the beets sent to the bureau. This additional work was very gladly undertaken, and has resulted in the accumulation of a greater number of facts than otherwise would have been possible.

The work of analysis was commenced with beets grown on the College Farm. Analyses were made frequently, in order to determine, if possible, the time of the greatest yield of sugar.

*Number 1.*—Beets grown by Mr. J. G. Smith, assistant agriculturist, Experiment Station, Lincoln, Lancaster county, Nebraska; variety, Vilmorin; seed received from Emerson Seed Co., Omaha, Neb.; planted April 4, 1889; soil, black loam, from fourteen inches to twenty-four inches deep. The ground was plowed during the early spring to a depth of seven inches, harrowed both ways, and then rolled. The seed was sown in drills forty-four inches apart, the drills each two rods long. The beets were hoed twice, and cultivated three times. They were harvested November 20, 1889.

The first analysis was made August 6, 1889. Gross weight of beet, 1014 grms.

(about 2 lbs. 4 oz.); net weight, 970 grms. (about 2 lbs. 1 oz.); sucrose, 11.40 per cent; glucose, not estimated.

The second analysis was made September 5, 1889. Gross weight of beet, 1325 grms. (about 3 lbs.); net weight, 1299 grms. (about 2 lbs. 10 oz.); sucrose, 2.25 per cent; glucose not estimated.

Third analysis, September 20, 1889. Gross weight of beet, 1777 grms. (about 3 lbs. 14 oz.); net weight, 1720 grms. (about 3 lbs. 12 oz.); sucrose, 2.25 per cent. No other estimations made.

Fourth analysis, October 14, 1889. Gross weight of beet, 950 grms. (about 2 lbs.); net weight, 875 grms. (about 1 lb. 12 oz.); specific gravity of juice, 1.050; total solids, 12.4; sucrose, 5.14 per cent; coefficient of purity, 41. + ; glucose, 0.312 per cent.

Fifth analysis, October 21, 1889. Gross weight of beet, 810 grms. (about 1 lb. 9 oz.); net weight, 745 grms. (about 1 lb. 6 oz.); specific gravity of juice, 1.080; total solids, 19.3; sucrose, 9.22 per cent; glucose, 0.137 per cent; coefficient of purity, 48.

Sixth analysis, October 25, 1889. Gross weight of beet, 926 grms. (about 2 lbs.); net weight, 864 grms. (about 1 lb. 14 oz.); specific gravity of juice, 1.050; total solids, 12.4; sucrose, 5.63 per cent; glucose, 0.277 per cent; coefficient of purity, 45.

Seventh analysis, October 26, 1889. Gross weight of beet, 1350 grms. (about 2 lbs. 15 oz.); net weight, 1285 grms. (about 2 lbs. 12 oz.); specific gravity of juice, 1.060; total solids, 14.7; sucrose, 7.21 per cent; glucose, 0.608 per cent; coefficient of purity, 49.

Eighth analysis, November 4, 1889. Gross weight of beet, 865 grms. (about 1 lb. 14 oz.); net weight, 775 grms. (about 1 lb. 10 oz.); specific gravity of juice, 1.100; total solids, 23.6; sucrose, 4.73 per cent; glucose, 0.403 per cent; coefficient of purity, 20.

Ninth analysis, November 11, 1889. Gross weight of beet, 1115 grms. (about 2 lbs. 7 oz.); net weight, 995 grms. (about 2 lbs.); specific gravity of juice, 1.040; total solids, 10; sucrose, 4.95 per cent; glucose, 0.423 per cent; coefficient of purity, 42. +

Tenth analysis, November 17, 1889. Gross weight of beet, 1020 grms. (about 2 lbs.); net weight, 960 grms. (about 1 lb. 15 oz.); specific gravity of juice, 1.060; total solids, 14.7; sucrose, 4.95; glucose, 0.213; coefficient of purity, 34.

*Number 2.*—Grown by J. G. Smith; variety, Percy's White Sugar; seed obtained from Detroit, distributed by the Chemical Department of the State University; planted May 3, 1889; soil, black loam, high ground; cultivation same as that given the Vilmorin variety; harvested November 20, 1889.

First analysis, August 6, 1889. Gross weight of beet, 1520 grms. (about 3 lbs. 6 oz.); net weight, 1450 grms. (about 3 lbs. 3 oz.); specific gravity of juice, 1.014; total solids, 10.4; sucrose, 6.98 per cent; glucose, not estimated; coefficient of purity, 67.

Second analysis, September 20, 1889. Gross weight of beet, 1809 grms. (about 3 lbs. 15 oz.); net weight, 1712 grms. (about 3 lbs. 12 oz.); specific gravity of juice, 1.031; total solids, 7.8; sucrose, 4.50 per cent; glucose, not estimated; coefficient of purity, 58.

Third analysis, October 5, 1889. Gross weight of beet, 990 grms. (about 2 lbs.

2 oz.); net weight, 900 grms. (about 1 lb. 15 oz.); specific gravity of juice, 1.080; total solids, 19.3; sucrose, 9.46 per cent; glucose, 0.226 per cent; coefficient of purity, 49.

Fourth analysis, October 14, 1889. Gross weight of beet, 675 grms. (about 1 lb. 8 oz.); net weight, 628 grms. (about 1 lb. 4 oz.); specific gravity of juice, 1.070; total solids; 17; sucrose, 9.01 per cent; glucose, 0.056 per cent; coefficient of purity, 53.

Fifth analysis, October 21, 1889. Gross weight of beet, 1266 grms. (about 2 lbs. 12 oz.); net weight, 1182 grms. (about 2 lbs. 10 oz.); specific gravity of juice, 1.068; total solids, 16.5; sucrose, 8.34 per cent; glucose, 0.105 per cent; coefficient of purity, 50.

Sixth analysis, October 25, 1889. Gross weight of beet, 2167 grms. (about 4 lbs. 12 oz.); net weight, 2077 grms. (about 4 lbs. 8 oz.); specific gravity of juice, 1.062; total solids, 15.2; sucrose, 6.75 per cent; glucose, 0.119 per cent; coefficient of purity, 44.+

Seventh analysis, October 29, 1889. Gross weight of beet, 1762 grms. (about 3 lbs. 13 oz.); net weight, 1675 grms. (about 3 lbs. 10 oz.); specific gravity of juice, 1.074; total solids, 18; sucrose, 9.01 per cent; glucose, 0.166 per cent; coefficient of purity, 50.

Eighth analysis, November 4, 1889. Gross weight of beet, 1050 grms. (about 2 lbs. 4 oz.); net weight, 920 grms. (about 2 lbs.); specific gravity of juice, 1.080; total solids, 19.3; sucrose, 4.96 per cent; glucose, 0.176 per cent; coefficient of purity, 26.

Ninth analysis, November 11, 1889. Gross weight of beet, 1840 grms. (about 4 lbs.); net weight, 1650 grms. (about 3 lbs. 10 oz.); specific gravity of juice, 1.090; total solids, 21.5; sucrose, 4.96 per cent; glucose, 0.290 per cent; coefficient of purity, 23.+

Tenth analysis, November 17, 1889. Gross weight of beet, 1345 grms. (about 2 lbs. 15 oz.); net weight, 1260 grms. (about 2 lbs. 12 oz.); specific gravity of juice, 1.070; total solids, 17; sucrose, 2.25 per cent; glucose, not estimated; coefficient of purity, 13.+

*Number 3.*—Grown by Mr. J. G. Smith; variety, Lane's Imperial; seed obtained from U. S. Dept. Agriculture, Washington, D. C., planted April 19, 1889; soil, black loam, low ground; cultivation, same as given Vilmorin seed; harvested November 20, 1889.

First analysis, August 6, 1889. Gross weight of beet, 2780 grms. (about 6 lbs. 2 oz.); net weight, 2680 grms. (about 5 lbs. 14 oz.); specific gravity of juice, 1.060; total solids, 14.7; sucrose, 8.11 per cent; glucose, not estimated; coefficient of purity, 55.

Second analysis, September 20, 1889. Gross weight of beet, 1390 grms. (about 3 lbs.); net weight, 1298 grms. (about 2 lbs. 12 oz.); specific gravity of juice, 1.054; total solids, 13.3; sucrose, 2.03 per cent; glucose, 0.112 per cent; coefficient of purity, 15.

Third analysis, October 4, 1889. Gross weight of beet, 1435 grms. (about 3 lbs. 2 oz.); net weight, 1330 grms. (about 2 lbs. 14 oz.); specific gravity of juice, 1.050; total solids, 12.4; sucrose, 6.81 per cent; glucose, 0.226 per cent; coefficient of purity, 54. +

Fourth analysis, October 14, 1889. Gross weight of beet, 1425 grms. (about 3 lbs. 2 oz.); net weight, 1375 grms. (about 3 lbs.); specific gravity of juice, 1.052; total solids, 12.9; sucrose, 4.28 per cent; glucose, 0.146 per cent; coefficient of purity, 33.+

Fifth analysis, October 21, 1889. Gross weight of beet, 1571 grms. (about 3 lbs. 7 oz.); net weight, 1513 grms. (about 3 lbs. 5 oz.); specific gravity of juice, 1.050; total solids, 12.4; sucrose, 5.14 per cent; glucose, 0.134 per cent; coefficient of purity, 41.

Sixth analysis, October 26, 1889. Gross weight of beet, 1805 grms. (about 3 lbs. 15 oz.); net weight, 1685 grms. (about 3 lbs. 11 oz.); specific gravity of juice, 1.050; total solids, 12.4; sucrose, 6.08 per cent; glucose, 0.220; coefficient of purity, 49.

Seventh analysis, October 29, 1889. Gross weight of beet, 1271 grms. (about 2 lbs. 12 oz.); net weight, 1140 grms. (about 2 lbs. 8 oz.); specific gravity of juice, 1.050; total solids, 12.4; sucrose, 2.50 per cent; glucose, 0.112 per cent; coefficient of purity, 20.

Eighth analysis, November 4, 1889. Gross weight of beet, 1025 grms. (about 2 lbs. 4 oz.); net weight, 880 grms. (about 1 lb. 15 oz.); specific gravity of juice, 1.079; total solids, 19.1; sucrose, 6.52 per cent; glucose, 0.340 per cent; coefficient of purity, 34.

Ninth analysis, November 11, 1889. Gross weight of beet, 1470 grms. (about 3 lbs. 4 oz.); specific gravity of juice, 1.050; total solids, 12.4; sucrose, 3.48 per cent; glucose, 0.268 per cent; coefficient of purity, 28.

Tenth analysis, November 17, 1889. Gross weight of beet, 525 grms. (about 1 lb. 2 oz.); net weight, 500 grms. (about 1 lb.); specific gravity of juice, 1.070; total solids, 17; sucrose, 4.96 per cent; glucose, 0.254 per cent; coefficient of purity, 29.

*Number 4.*—Grown by Mr. J. G. Smith; variety, White Sugar, obtained from the Emerson Seed Co., Omaha, Neb.; planted May 2, 1889; soil, black loam, high ground; cultivation, same as given the afore-mentioned varieties; harvested November 20, 1889.

First analysis, August 6, 1889. Gross weight of beet, 1110 grms. (about 2 lbs. 8 oz.); net weight, 1060 grms. (about 2 lbs. 4 oz.); specific gravity of juice, 1.048; total solids, 10.7; sucrose, 7.66 per cent; glucose, 0.131 per cent; coefficient of purity, 71.

Second analysis, September 5, 1889. Gross weight of beet, 2053 grms. (about 4 lbs. 2 oz.); net weight, 2007 grms. (about 4 lbs.); specific gravity of juice, 1.050; total solids, 12.4; sucrose, 5.18 per cent; glucose, 0.185 per cent; coefficient of purity, 41.

Third analysis, September 20, 1889. Gross weight of beet, 2167 grms. (about 4 lbs. 12 oz.); net weight, 1996 grms. (about 4 lbs. 4 oz.); specific gravity of juice, 1.053; total solids, 13.1; sucrose, 4.50 per cent; glucose, not estimated; coefficient of purity, 34.

Fourth analysis, October 7, 1889. Gross weight of beet, 1350 grms. (about 2 lbs. 15 oz.); net weight, 1272 grms. (about 2 lbs. 11 oz.); specific gravity of juice, 1.065; total solids, 15.9 per cent; sucrose, 6.31 per cent; glucose, 0.008 per cent; coefficient of purity, 40.

Fifth analysis, October 14, 1889. Gross weight of beet, 921 grms. (about 2 lbs.); net weight, 886 grms. (about 1 lb. 14 oz.); specific gravity of juice, 1.082; total solids, 19.7; sucrose, 9.01 per cent; glucose, 0.165 per cent; coefficient of purity, 46.

Sixth analysis, October 21, 1889. Gross weight of beet, 1562 grms. (about 3 lbs. 7 oz.); net weight, 1473 grms. (about 3 lbs.); specific gravity of juice, 1.070; total solids, 17; sucrose, 7.66 per cent; glucose, 0.070 per cent; coefficient of purity, 45.

Seventh analysis, October 26, 1889. Gross weight of beet, 1553 grms. (about 3 lbs. 3 oz.); net weight, 1480 grms. (about 3 lbs.); specific gravity of juice, 1.042; total solids, 10; sucrose, 5.63 per cent; glucose, 0.481; coefficient of purity, 56.

Eighth analysis, November 4, 1889. Gross weight of beet, 1670 grms. (about 3 lbs. 10 oz.); net weight, 1545 grms. (about 3 lbs. 3 oz.); specific gravity of juice, 1.100 ; total solids, 23.7; sucrose, 6.08 per cent; glucose, 0.100 per cent; coefficient of purity, 26.

Ninth analysis, November 11, 1889. Gross weight of beet, 1150 grms. (about 2 lbs. 8 oz.); net weight, 1055 grms. (about 2 lbs. 1 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 9.01 per cent; glucose, 0.117; coefficient of purity, 40.

Tenth analysis, November 17, 1889. Gross weight of beet, 1665 grms. (about 3 lbs. 10 oz.); net weight, 1600 grms. (about 3 lbs. 4 oz.); specific gravity of juice, 1.060; total solids, 14.7; sucrose, 2.25 per cent; glucose, not estimated; coefficient of purity, 15.

The following report of Mr. J. G. Smith gives additional information regarding culture and yield.

The yield per row, taking 40 beets per row as the average, is:

| | *Pounds per row.* | *Rate of yield per acre (long tons).* |
|---|---|---|
| White Sugar | 188 | 30 |
| Percy's White | 220 | 35 |
| Vilmorin | 152 | 24 |
| Lane's Imperial | 152 | 24 |

This yield would be the estimated maximum. Beet seed is as a rule of very poor quality, and will not yield much over seven-tenths of a stand. An estimated "eight-tenths' stand" would yield as follows:

White Sugar, 24 tons per acre.
Percy's White, 28 tons per acre.
Vilmorin, 19.2 tons per acre.
Lane's Imperial, 19.2 tons per acre.

Estimated cost per acre:

| | |
|---|---|
| Plowing and harrowing twice | $ 1 25 |
| Rolling | 25 |
| Hoeing twice | 2 50 |
| Cultivating three times | 1 50 |
| Harvesting (man and team for two days) | 6 00 |
| Storing 10 cents per ton (average twenty tons) | 2 00 |
| Estimated total cost | $13 50 |

The season has been favorable for the growth of all root crops; no long-continued dry weather and no very hot weather after the middle of July.

Respectfully, J. G. SMITH.

*Number 5.*—Beets grown by Hon. Robert W. Furnas, Brownville, Nemaha county; variety, Vilmorin; seed sown in May, 1889; soil, black loam; cultivated twice; harvested November 8, 1889.

First analysis, October 14, 1889. Gross weight of beet, 548 grms. (about 1 lb. 3 oz.); net weight, 529 grms. (about 1 lb. 2 oz.); specific gravity of juice, 1.090; total solids, 21.5; sucrose, 1397 per cent; glucose, 0.011 per cent; coefficient of purity, 65.

Second analysis, October 14, 1889. Gross weight of beet, 1181 grms. (about 2 lbs. 9 oz.); net weight, 1131 grms. (about 2 lbs. 4 oz.); specific gravity of juiee, 1.100; total solids, 23.7; sucrose, 15.55 per cent; glucose, 0.100 per cent; coefficient of purity, 65.

Third analysis, October 14, 1889. Gross weight of beet, 1845 grms. (about 4 lbs.); net weight, 1765 grms. (about 3 lbs. 13 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 15.77 per cent; glucose, 0.803 per cent; coefficient of purity, 67.

Fourth analysis, November 12, 1889. Gross weight of beet, 1120 grms. (about 2 lbs. 7 oz.); net weight, 1070 grms. (about 2 lbs. 5 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 17.17 per cent; glucose, 0.180 per cent; coefficient of purity, 72.

Fifth analysis, November 12, 1889. Gross weight of beet, 1080 grms. (about 2 lbs. 4 oz.); net weight, 1030 grms. (about 2 lbs.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 20.28 per cent; glucose, 0.158 per cent; coefficient of purity, 86.

*Number 6.*—Beets grown by Charles Redfield, Max, Dundy county; variety, Vilmorin; sown May 3, 1889; soil, rich and mellow; cultivated with hoe and horse cultivator; harvested October 16, 1889; yield, 100 bushels per acre; season, very dry.

First analysis, October 30, 1889. Gross weight of beet, 928 grms. (about 2 lbs.); net weight, 875 grms. (about 1 lb. 14 oz.); specific gravity of juice, 1.092; total solids, 21.5; sucrose, 15.77 per cent; glucose, 0.300 per cent; coefficient of purity, 73.

Second analysis, October 30, 1889. Gross weight of beet, 630 grms. (about 1 lb. 6 oz.); net weight, 610 grms. (about 1 lb. 4 oz.); specific gravity of juice, 1.100; total solids, 23.6; sucrose, 14.19 per cent; glucose, 0.140 per cent; coefficient of purity, 60.

Third analysis, October 30, 1889. Gross weight of beet, 725 grms. (about 1 lb. 9 oz.); net weight, 695 grms. (about 1 lb. 7 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 17.57 per cent; glucose, 0.019 per cent; coefficient of purity, 75.

Fourth analysis, October 30, 1889. Gross weight of beet, 980 grms. (about 2 lbs. 2 oz.); net weight, 945 grms. (about 2 lbs.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 16.22 per cent; glucose, 0.012 per cent; coefficient of purity, 69.

*Number 7.*—The following report concerning the seed forwarded to Fort Niobrara, Cherry county, is sent by August V. Kautz, colonel of the Eighth infantry, commanding post: Two varieties of seed were planted, *i. e.*, White Improved Imperial Sugar and Vilmorin; seed sown May 20, 1889; harvested October 3, 1889. The season was not favorable in this locality, as it was very dry, and the corn suffered much. The company gardens were irrigated to some extent. I have no doubt that both beets and sorghum can be made to succeed in this locality, but I am sorry I cannot prove it more satisfactorily this time.

First analysis, October 31, 1889. Beet grown by Company "H," 8th infantry; variety, Improved Imperial. Gross weight of beet, 1625 grms. (about 3 lbs. 8 oz.); net weight, 1545 grms. (about 3 lbs. 6 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 10.99 per cent; glucose, 0.150 per cent; coefficient of purity, 47.

Second analysis, October 31, 1889. Beet grown by Company "F;" variety, Vilmorin. Gross weight of beet, 820 grms. (about 1 lb. 12 oz.); net weight, 780 grms. (about 1 lb. 10 oz.); total solids, 23.7; specific gravity of juice, 1.100; sucrose, 14.65 per cent; glucose, 0.370 per cent; coefficient of purity, 62.

Third analysis, October 31, 1889. Small, reddish beet, grown by Company "F;" variety, not known. Gross weight of beet, 466 grms. (about 1 lb.); net weight 450 grms. (about 15 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose 20.28 per cent; glucose, 0.025 per cent; coefficient of purity, 86.

Fourth analysis, October 31, 1889. White beet, grown by Company "F;" variety, unknown. Gross weight, 675 grms. (about 1 lb. 7 oz.); net weight, 640 grms. (about 1 lb. 6 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 16 per cent; glucose, 0.180 per cent; coefficient of purity, 70.

*Number 8* was received from Dr. F. Verges, Norfolk, Madison county, Nebraska. Variety, Sicilian. Seed was obtained from D. Landreth & Sons, Philadelphia, Pa. Seed planted first week in May, sixteen inches apart; cultivation, hand hoeing; soil, dark clay, about eighty feet above our bottom land; located near the S. W. corner of N. E. ¼ of S. W. ¼, section 22, township 24, range 1 west. The beets were harvested November 6, 1889.

First analysis, November 14, 1889. Gross weight of beet, 610 grms. (about 1 lb. 5 oz.); net weight, 570 grms. (about 1 lb. 4 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 10.14 per cent; glucose, 0.146 per cent; coefficient of purity, 43.

Second analysis, November 14, 1889. Gross weight of beet, 1260 grms. (about 2 lbs. 8 oz.); net weight, 1200 grms. (about 2 lbs. 6 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 8.34 per cent; glucose, 0.304 per cent; coefficient of purity, 45.

Third analysis, November 14, 1889. Gross weight of beet, 630 grms. (about 1 lb. 5 oz.; net weight, 585 grms. (about 1 lb. 4 oz.); specific gravity of juice, 1.100; sucrose, 8.34 per cent; glucose, 0.277 per cent; coefficient of purity, 45; total solids, 23.7

Fourth analaysis, November 14, 1889. Gross weight of beet, 1630 grms. (about 3 lbs. 8 oz.); net weight, 1560 grms. (about 3 lbs. 6 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 10.14 per cent; glucose, 0.423 per cent; coefficient of purity, 43.

*Number 9.*—Grown by Mr. T. H. Marsland, Lincoln, Lancaster county, Neb.; variety, Vilmorin; seed planted May 15, 1889; soil, rich, sandy loam, high ground; cultivation, hand hoeing. The analysis was made October 15, the same day the beet was gathered. Gross weight of beet, 1796 grms. (about 3 lbs. 15 oz.); net weight, 1735 grms. (about 3 lbs. 12 oz.); specific gravity of juice, 1.070; total solids, 17; sucrose, 9.01 per cent; glucose, 0.094 per cent; coefficient of purity, 53.

*Number 10.*—Beets grown by W. H. Reynolds, president of Dawes county Agricultural Society, Chadron, Neb.; seed not named; received from Washington, D. C. Seed was planted May 20, 1889; soil, dark, sandy loam; no cultivation except cutting the weeds once. The rows were three and one-half feet apart; beets were too thick in the row to do well; the crop was harvested September 15, 1889. The season was not favorable for root crops.

First analysis, November 11, 1889. Gross weight of beet, 880 grms. (about 1 lb. 14 oz.); net weight, 835 grms. (about 1 lb. 12 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 16.30 per cent; glucose, 0.163 per cent; coefficient of purity, 70.

Second analysis, November 11, 1889. Gross weight of beet, 960 grms. (about 2 lbs. 1 oz.); net weight, 900 grms. (about 1 lb. 15 oz.); specific gravity of juice, 1.090; total solids, 21.5; sucrose, 9.24 per cent; glucose, 0.096 per cent; coefficient of purity, 43.

Third analysis, November 11, 1889. Gross weight of beet, 1320 grms. (about 2 lbs. 15 oz,); net weight 1220 grms. (about 2 lbs. 12 oz.); specific gravity of juice, 1.080; total solids, 19.3; sucrose, 16.30 per cent; glucose, 0.087 per cent; coefficient of purity, 84.

Fourth analysis, November 11, 1889. Gross weight of beet, 790 grms. (about 1 lb. 11 oz.); net weight, 705 grms. (about 1 lb. 8 oz.); specific gravity of juice, 1.075; total solids, 18.1; sucrose, 12.61 per cent; glucose, 0.154 per cent; coefficient of purity, 70.

*Number 11.*—This sample was sent us by Hon. C. H. Cornell, Valentine, Cherry county, Nebraska. Beets grown by Daniel Hubbard. Variety, Vilmorin. Seed received from the Chemical Department of the University; planted May 15, 1889; soil, black sandy loam; cultivated with the plow; harvested, October 19, 1889. The season was dry after July 1, 1889; prior to that date it was very favorable.

First analysis, November 30, 1889. Gross weight of beet, 1930 grms. (about 4 lbs. 4 oz.); net weight, 1780 grms. (about 3 lbs. 14 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 15.90 per cent; glucose, 0.176 per cent; coefficient of purity, 63.

Second analysis, November 30, 1889. Gross weight of beet, 2090 grms. (about 4 lbs. 8 oz.); net weight, 1900 grms. (about 4 lbs. 3 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 12.62 per cent; glucose, 0.098; coefficient of purity, 53.

Third analysis, November 30, 1889. Gross weight of beet, 1340 grms. (about 2 lbs. 15 oz.); net weight, 1245 grms. (about 2 lbs. 12 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 12.65 per cent; glucose, 0.143 per cent; coefficient of purity, 54.

*Number 12.*—Samples sent by Mr. A. B. Perkins, Grand Island, Hall county. First analysis, November 29, 1889. Gross weight of beet, 495 grms. (about 1 lb.); net weight, 465 grms. (about 15 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 14.14 per cent; glucose, 0.101 per cent; coefficient of purity, 59.

Second analysis, November 29, 1889. Gross weight of beet, 660 grms. (about 1 lb. 7 oz.); net weight, 625 grms. (about 1 lb. 5 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 16.90 per cent; glucose, 0.102 per cent; coefficient of purity, 71.

Third analysis, November 29, 1889. Gross weight of beet, 530 grms. (about 1 lb. 2 oz.); net weight, 500 grms. (about 1 lb.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 20.27 per cent; glucose, 0.080 per cent; coefficient of purity, 86.

Fourth analysis, November 29, 1889. Gross weight of beet, 480 grms. (about 1 lb.); net weight, 455 grms. (about 15 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 19.10 per cent; glucose, 0.190 per cent; coefficient of purity, 80.

Fifth analysis, November 30, 1889. Gross weight of beet, 1060 grms. (about 2 lbs. 5 oz.); net weight, 965 grms. (about 2 lbs. 2 oz.); specific gravity of juice, 1.070; total solids, 17; sucrose, 13.52 per cent; glucose, 0.105 per cent; coefficient of purity, 80.

*Number 13.*—Samples sent by Mr. H. T. Jul. Fuehrman, of Grand Island, Hall county, Nebraska. Two varieties of American seed were planted, *i. e.*, Imperial and Vilmorin, May 10, 1889. Soil, sandy loam; cultivated three times, thinned out once; harvested September 25, 1889; yield per acre, 18 to 22 tons; price per ton at factory, $3, $3.50, $4; season, wet.

The analysis of the sample from Imperial seed was made November 2, 1889. Gross weight of beet, 955 grms. (about 2 lbs. 1 oz.); net weight, 880 grms. (about 1 lb. 15 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 20.28 per cent; glucose, 0.147 per cent; coefficient of purity, 86.

Analysis of American Vilmorin sample, November 2, 1889. Gross weight of beet, 1462 grms. (about 3 lbs. 3 oz ); net weight, 1345 grms. (about 2 lbs. 15 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 20.29 per cent; glucose, 0.254 per cent; coefficient of purity, 86.

From Mr. Fuehrman we received two samples, grown from German seed, *i. e.*, Vilmorin and Klein Wanzleben. This seed was planted from the 10th to 15th of June, 1889. Soil, sandy loam; cultivation, same as for American seed; harvested October 20, 1889; yield, 18 to 20 tons per acre; season, wet.

Analysis of the German Vilmorin, November 2, 1889. Gross weight of beet, 1000 grms. (about 2 lbs.); net weight, 900 grms. (about 1 lb. 15 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 21.41 per cent; glucose, 0.138 per cent; coefficient of purity, 90.

Analysis of Wanzleben, November 2, 1889. Gross weight of beet, 1015 grms. (about 2 lbs. 3 oz.); net weight, 980 grms. (about 2 lbs. 2 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 18.25 per cent; glucose, 0.296 per cent; coefficient of purity, 77.

*Number 14.*—Samples analyzed were received from Rev. Mr. Hawkins, of the Wellfleet Real Estate and Improvement Co., Wellfleet, Lincoln county, Neb. The beets were grown in the valley of the Medicine creek. Soil, rich, deep, sandy, loam; variety of seed, Vilmorin, received from Washington, D. C.; planted May 15, 1889. The ground was deeply plowed, seed sown in drills; beets thinned out, about one foot apart; they were hoed twice; harvested October 15, 1889; yield, 25 tons per acre; season, ordinary.

The samples analyzed October 28, 1889, had been exhibited at the fair at St. Louis, and were much bruised and partly decayed. This condition, no doubt, greatly reduced the sugar contents. Gross weight of beet, 3155 grms. (about 7 lbs.); net weight, 6 lbs. 10 oz.; specific gravity of juice, 1.083; total solids, 19.9; sucrose, 9 per cent; glucose, 0.500 per cent; coefficient of purity, 45.

Second analysis, October 28, 1889. Gross weight of beet, 1510 grms. (about 3 lbs. 5 oz.); net weight, 1435 grms. (about 3 lbs. 1 oz.); specific gravity of juice, 1.070; total solids, 17.0; sucrose, 5.80 per cent; glucose, 0.470 per cent; coefficient of purity, 34. +

Third analysis, October 28, 1889. Gross weight of beet, 1920 grms. (about 4 lbs. 3 oz.); net weight, 1839 grms. (about 4 lbs.); specific gravity of juice, 1.069; total solids, 16.8; sucrose, 7.20 per cent; glucose, 0.270 per cent; coefficient of purity, 43.

Fourth analysis, November 12, 1889. Gross weight of beet, 800 grms. (about 1 lb. 12 oz.); net weight, 730 grms. (about 1 lb. 9 oz.); specific gravity of juice, 1.040; total solids, 10; sucrose, 9.02 per cent; glucose, 0.075 per cent; coefficient of purity, 90.

Fifth analysis, November 12, 1889. Gross weight of beet, 760 grms. (about 1 lb. 10 oz.); net weight, 690 grms. (about 1 lb. 8 oz.); specific gravity of juice, 1.060; total solids, 14.7; sucrose, 13.4 per cent; glucose, 0.240 per cent; coefficient of purity, 91.

The last two samples of beets were grown on the south side of Medicine creek.

Sixth analysis, November 12, 1889. Gross weight of beet, 1720 grms. (about 3 lbs. 12 oz.); net weight, 1600 grms. (about 3 lbs. 5 oz.); specific gravity of juice, 1.040; total solids, 10; sucrose, 9.60 per cent; glucose, 0.260 per cent; coefficient of purity, 96.

Seventh analysis, November 12, 1889. Gross weight of beet, 1750 grms. (about 3 lbs. 13 oz.); net weight, 1570 grms. (about 3 lbs. 7 oz.); specific gravity of juice, 1.070; total solids; 17; sucrose, 6.75 per cent; glucose, 0.342 per cent; coefficient of purity, 39. +

The last two samples were raised on the north side of Medicine creek.

Eighth analysis, December 2, 1889. Gross weight of beet, 750 grms. (about 1 lb. 10 oz.); net weight, 650 grms. (about 1 lb. 7 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 14.04 per cent; glucose, 0.113 per cent; coefficient of purity, 60.

Ninth analysis; December 2, 1889. Gross weight of beet, 690 grms. (about 1 lb. 8 oz.); net weight, 580 grms. (about 1 lb. 4 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 15.77 per cent; glucose, 0.113 per cent; coefficient of purity, 66. +

The following nine samples were consigned to us by Mr. Ira Ford, president Adams County Agricultural Society, he having distributed seed sent out by the Chemical Department of the University:

*Number 15.*—Grown by C. B. Kemple, Hastings, Adams county, Nebraska; variety, Vilmorin; planted May 1, 1889; soil, black, sandy loam; analyzed October 28, 1889. Gross weight of beet, 849 grms. (about 1 lb. 13 oz.); net weight, 805 grms. (about 1 lb. 11 oz.); specific gravity of juice, 1.098; total solids, 21.6; sucrose, 13.28 per cent; glucose, 0.370 per cent; coefficient of purity, 61.

*Number 16.*—Grown by H. C. Armstrong, Hastings, Adams county, Nebraska; variety, Vilmorin; seed planted April 22, 1889; soil, sandy loam that had been under cultivation for six years; no manure was used, and the ground had never been manured; the beets were hoed twice; harvested October 11, 1889; analyzed October 29, 1889. Gross weight of beet, 1440 grms. (about 3 lbs. 3 oz.); net weight, 1310 grms. (about 2 lbs. 13 oz.); specific gravity of juice, 1.070; total solids, 17; sucrose, 11.49 per cent; glucose, 0.010 per cent; coefficient of purity, 68.

*Number 17.*— Grown by S. M. Bates; variety not stated; soil, black sandy loam; seed planted April 23, 1889; harvested October 17, 1889; analyzed October 29, 1889. Gross weight of beet, 635 grms. (about 1 lb. 6 oz.); net weight, 595 grms. (about 1 lb. 4 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 19.52 per cent; glucose, 0.010 per cent; coefficient of purity, 80.

*Number 18.*— Grown by W. M. Lowman, Hastings, Adams county, Nebraska; variety, Vilmorin; clay soil that was close to the bluffs of the Platte river; soil had been slightly manured; seed planted May 15, 1889; beets were cultivated with a hoe; plants thinned out to thirteen inches apart; harvested October 22, 1889; analyzed October 29, 1888. Gross weight of beet, 1620 grms. (about 3 lbs. 8 oz.); net weight, 1510 grms. (about 3 lbs. 5 oz.); specific gravity of juice, 1.082; total solids, 19.3; sucrose, 9.91 per cent; glucose, 0.052 per cent; coefficient of purity, 51.

*Number 19.*— Consignor, Mr. Ira Ford; variety, Vilmorin; analysis, October 29, 1889. Gross weight of beet, 1610 grms. (about 3 lbs. 8 oz.); net weight, 1520 grms. (about 3 lbs. 5 oz.); specific gravity of juice, 1.085; total solids, 20.4; sucrose, 10.14 per cent; glucose, 0.009 per cent; coefficient of purity. 50.

*Number 20.*— Consignor, Mr. Ira Ford; red beet, found with Vilmorin; analysis, October 30, 1889. Gross weight of beet, 1050 grms. (about 2 lbs. 4 oz.); net weight, 1010 grms. (about 2 lbs. 2 oz.); specific gravity of juice, 1.080; total solids, 20.4; sucrose, 10.14 per cent; glucose, 0.017 per cent; coefficient of purity, 52.

*Number 21.*—Beets grown by Mr. Rinker, of Adams county, Nebraska; variety, Lane's Imperial; planted May 10, 1889; soil, black sandy loam, an old pasture, plowed in 1888; no crop planted, no manure used; beets harvested October 25, 1889; analyzed November 15, 1889. Gross weight of beet, 405 grms. (about 14 oz.); net weight, 375 grms. (about 12 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 15.32 per cent; glucose, 0.230 per cent; coefficient of purity, 65.

*Number 22.*—Beets grown by Mr. F. Bates, of Adams county, Nebraska; variety, Vilmorin; analyzed November 15, 1889. Gross weight of beet, 385 grms. (about 13 oz.); net weight, 365 grms. (about 12 oz.); specific gravity of juice, 1.100; total solids, 23.7 per cent; sucrose, 13.51 per cent; glucose, 0.100 per cent; coefficient of purity, 58.

*Number 23.*—Beets grown by S. G. Johnson, Adams county, Nebraska; variety, Vilmorin; analyzed November 15, 1889. Gross weight of beet, 780 grms. (about 1 lb. 11 oz.); net weight, 730 grms. (about 1 lb. 9 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 9.69 per cent; glucose, 0.160 per cent; coefficient of purity, 40.

*Number 24.*—Beets grown by W. W. Philleo, Ayr, Adams county, Nebraska; variety, Vilmorin; planted June 1, 1889; soil, sandy bottom land in Blue river valley; no manure; analyzed January 14, 1890. Gross weight of beet, 317 grms. (about 11 oz.); net weight, 293 grms. (about 10 oz.) specific gravity of juice, 1.100; total solids, 23.7; sucrose, 20.28 per cent; glucose, 0.104 per cent; coefficient of purity, 86.

Second analysis, January 14, 1890. Gross weight of beet, 697 grms. (about 1 lb. 8 oz.); net weight, 660 grms. (about 1 lb. 7 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 15.09 per cent; glucose, 0.009 per cent; coefficient of purity, 64.

Third analysis, January 14, 1890. Gross weight of beet, 968 grms. (about 2 lbs.); net weight, 925 grms. (about 1 lb. 15 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 15.99 per cent; glucose, 0.107 per cent; coefficient of purity, 66.

Fourth analysis, January 14, 1890. Gross weight of beet, 341 grms. (about 12 oz.); net weight, 329 grms. (about 10 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 19.60 per cent; glucose, 0.174 per cent; coefficient of purity, 83.

*Number 25.*—Beets grown by W. W. Philleo, Ayr, Adams county, Nebraska; variety, Lane's Imperial; planted June 1, 1889; soil, sandy bottom land in Blue river valley; analyzed January 15, 1890. Gross weight of beet, 352 grms. (about 13 oz.); net weight, 342 grms. (about 12 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 21.18 per cent; glucose, 0.087 per cent; coefficient of purity, 89.

Second analysis, January 15, 1890. Gross weight of beet, 465 grms. (about 1 lb.); net weight, 446 grms. (about 15 oz.); specific gravity of juice, 1.095; total solids, 22.6; sucrose, 15.09 per cent; glucose, 0.006 per cent; coefficient of purity, 67. This beet had sprouts an inch long.

Third analysis, January 15, 1890. Gross weight of beet, 405 grms. (about 14 oz.); net weight, 385 grms. (about 13 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 22.08 per cent; glucose, 0.009 per cent; coefficient of purity, 93.

Fourth analysis, January 15, 1890. Gross weight of beet, 700 grms. (about 1 lb. 8 oz.); net weight, 671 grms. (about 1 lb. 7 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 20.28 per cent; glucose, 0.076 per cent; coefficient of purity, 85. This beet had begun to sprout.

The following samples were sent us for analysis by Hon. John Jenkins of the State Bureau of Labor and Industrial Statistics:

*Number 26.*—Beets grown by H. J. Davis, Union, Cass county, Nebraska; seed planted May 15, 1889; soil, black, sandy loam; the beets were hoed and plowed; harvested October 6, 1889; season, dry; analyzed October 16, 1889. Gross weight of beet, 1450 grms. (about 3 lbs. 3 oz.); net weight, 1375 grms. (about 3 lbs.); specific gravity of juice, 1 050; total solids, 12.4; sucrose, 497 per cent; glucose, 0.310 per cent; coefficient of purity, 40. +

*Number 27.*—Beets grown by J. S. Howell, Howells, Colfax county, Nebraska; seed planted May 5, 1889; soil, very rich creek bottom; harvested October 4, 1889; analyzed October 11, 1889. A large pinkish beet. Gross weight, 2750 grms. (about 6 lbs.); net weight, 2640 grms. (about 5 lbs 12 oz.); specific gravity of juice, 1.072; total solids, 17; sucrose, 10.36 per cent; glucose, 0.131 per cent; coefficient of purity, 61.

*Number 28.*—Beets grown by John Fees, Utica, Seward county, Nebraska; seed planted May 3, 1889; black upland soil; beets were hoed once a week until July 15; harvested October 4, 1889; analyzed October 17, 1889. Gross weight of beet, 1997 grms. (about 4 lbs. 6 oz.); net weight, 1930 grms. (about 4 lbs. 4 oz.); specific gravity of juice, 1.060; total solids, 14.7; sucrose, 6.53 per cent; glucose, 0.342 per cent; coefficient of purity, 45.

*Number 29.*—Beets grown by G. H. Stocking, Wahoo, Saunders county, Nebraska; planted June 5, 1889; soil, sandy loam in the Wahoo valley; beets were hoed once; harvested October 8, 1889; analyzed October 18, 1889. Gross weight of beet, 971 grms. (about 2 lbs. 2 oz.); net weight, 930 grms. (about 2 lbs.); specific gravity of juice, 1.062; total solids, 15.2; sucrose, 4.05 per cent; glucose, 0.350 per cent; coefficient of purity, 26.

*Number 30.*—Beets grown by E. S. Blanchard, Beaver Crossing, Seward county, Nebraska; soil, black loam; hoed once; harvested October 7, 1889; analyzed October 18, 1889. Gross weight of beet, 1240 grms. (about 2 lbs. 11 oz.); net weight, 1185 grms. (about 2 lbs. 9 oz.); specific gravity of juice, 1.070; sucrose, 6.76 per cent; glucose, 0.204 per cent; total solids, 17; coefficient of purity, 39.

*Number 31.*—Beets grown by J. Leason & Son, Fairfield, Clay county, Nebraska; one-half rod of land planted; seed sown May 15, 1889; soil, upland prairie; cultivated by hand; harvested September 30, 1889; analyzed October 16, 1889. Gross weight of beet, 3010 grms. (about 6 lbs. 9 oz.); net weight, 2904 grms. (about 6 lbs. 5 oz.); specific gravity of juice, 1.053; total solids, 12.4; sucrose, 4.27 per cent; glucose, 0.833 per cent; coefficient of purity, 34.

*Number 32.*—Beets grown by S. Weiley, Pilger, Stanton county, Nebraska; seed planted May 3, 1889; soil, sandy loam; ordinary garden cultivation; harvested September 29, 1889; analyzed October 17, 1889. Gross weight of beet, 1616 grms. (about 3 lbs. 8 oz.); net weight, 1584 grms. (about 3 lbs. 4 oz.); specific gravity of juice, 1.060; total solids, 14.7; sucrose, 7.88 per cent; glucose, 0.625 per cent; coefficient of purity, 54.

*Number 33.*—Beets grown by C. T. Kenyon, Howard City, Howard county, Nebraska; one-sixteenth of an acre planted; seed sown May 28, 1889; soil, sandy clay; harvested October 3, 1889; analyzed October 17, 1889. Gross weight of beet, 1000 grms. (about 2 lbs. 3 oz.); net weight, 975 grms. (about 2 lbs.); specific gravity of juice, 1.080; total solids, 19.3; sucrose, 10.14 per cent; glucose, 0.413 per cent; coefficient of purity, 52.

Second analysis, October 17, 1889. Gross weight of beet, 440 grms. (about 15 oz.); net weight, 420 grms. (about 14 oz.); specific gravity of juice, 1.095; total solids, 21.6; sucrose, 12.39 per cent; glucose, 0.314 per cent; coefficient of purity, 57.

*Number 34.*—Beets grown by H. B. Good, Tecumseh, Johnson county, Nebraska; One-tenth of an acre planted; seed planted May 15, 1889; soil, sandy loam; cultivation same as corn; harvested October 5, 1889; analyzed October 19, 1889. Gross weight of beet, 2530 grms. (about 5 lbs. 3 oz.); net weight, 2500 grms. (about 5 lbs. 1 oz); specific gravity of juice, 1.070; total solids, 17; sucrose, 7.88 per cent; glucose, 0.100 per cent; coefficient of purity, 46.

*Number 35.*—Beets grown by A. C. Robbins, Orleans, Harlan county, Nebraska; variety, Vilmorin; planted May 14, 1889; very rich sandy loam, bottom of Sappa creek; cultivated by plowing and keeping out the weeds; harvested October 5, 1889; analyzed October 19, 1889. Gross weight of beet, 1730 grms. (about 3 lbs. 12 oz.); net weight, 1700 grms. (about 3 lbs 10 oz.); specific gravity of juice, 1.060; total solids, 14.7; sucrose, 6.76 per cent; glucose, 0.016 per cent; coefficient of purity, 45.

*Number 36.*—Beets grown by John C. Lloyd, Utica, Seward county, Nebraska; planted May 5, 1889; soil, black loam; season favorable; harvested September 26, 1889; analyzed October 12, 1889. Gross weight of beet, 2840 grms. (about 4 lbs. 6 oz.); net weight, 2742 grms. (about 6 lbs.); specific gravity of juice, 1.045; total solids, 10.1; sucrose, 4.95 per cent; glucose, 0.100 per cent; coefficient of purity, 49.

*Number 37.*—Grown by ——; soil, ——; planted and harvested, ——; analyzed October 17, 1889. Gross weight of beet, 1620 grms. (about 3 lbs. 8 oz.); net weight, 1555 grms. (about 3 lbs. 6 oz.); specific gravity of juice, 1.095; total solids, 21.6; sucrose, 13.52 per cent; glucose, 0.480 per cent; coefficient of purity, 62.

*Number 38.*—Grown by ——; soil,——; planted and harvested, ——; analyzed October 11, 1889. Gross weight of beet, 300 grms. (about 10 oz.); net weight, 280 grms. (about 9 oz.); specific gravity of juice, 1.090; total solids, 21.5; sucrose, 14.42 per cent; glucose, 0.212 per cent; coefficient of purity, 67.

*Number 39.*—Beets grown by Harry Spindler; soil, ——; harvested ——; analyzed October 16, 1889. Gross weight of beet, 1139 grms. (about 2 lbs. 8 oz.); net weight, 1084 grms. (about 2 lbs. 3 oz.); specific gravity of juice, 1.070; total solids, 17; sucrose, 7.66 per cent; glucose, 0 440 per cent; coefficient of purity, 45.

*Number 40.*—Beets grown by ——; soil, ——; planted and harvested ——; analyzed October 20, 1889. Gross weight of beet, 653 grms. (about 1 lb. 7 oz.); net weight, 636 grms. (about 1 lb. 5 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 14.65 per cent; glucose, 0.495 per cent; coefficient of purity, 62.

*Number 41.*—Beets grown by Hugh Robertson, Webster, Dodge county, Nebraska; variety, Vilmorin; planted May 20, 1889; soil, good upland prairie; hoed several times; harvested October 1, 1889; analyzed October 20, 1889. Gross weight of beet, 1422 grms. (about 3 lbs.); net weight, 1355 grms. (about 2 lbs. 14 oz.); specific gravity of juice, 1.080; total solids, 19.3; sucrose, 9.01 per cent; glucose, 0.421 per cent; coefficient of purity, 47.

*Number 42.*—Beets grown by L. E. Wales, Edgar, Clay county, Nebraska; planted June 1, 1889; soil, black loam, upland prairies; no extra given the crop; harvested October 1, 1889; analyzed October 20, 1889. Gross weight of beet, 1385 grms. (3 lbs.); net weight, 1337 grms. (about 2 lbs. 15 oz.); specific gravity of juice, 1.07; total solids, 17; sucrose, 6.54 per cent; glucose, 0.180 per cent; coefficient of purity, 38.

*Number 43.*—Beets grown by E. D. Chapin, McCook, Red Willow county, Nebraska; variety, White Sugar; one-eighth of an acre planted; seed planted May 10, 1889; soil, black, sandy loam; plowed once, hoed twice; harvested October 9, 1889; analyzed October 22, 1889. Gross weight of beet, 2057 grms. (about 4 lbs. 8 oz.); net weight, 1950 grms. (about 4 lbs. 4 oz.); specific gravity of juice, 1.090; total solids, 21.5; sucrose, 12.62 per cent; glucose, 0.220 per cent; coefficient of purity, 59.

*Number 44.*—Beets grown by N. B. Bisbee, Chambers, Holt county, Nebraska; variety, Lane's Imperial; one-quarter of an acre planted; seed sown May 25, 1889; soil, sandy loam; crop hoed twice; harvested October 10, 1889; analyzed October 24, 1889. Gross weight, 1582 grms. (about 3 lbs. 6 oz.); net weight, 1526 grms. (about 3 lbs. 4 oz.); specific gravity of juice, 1.086; total solids, 19.4; sucrose, 11.26 per cent; glucose, 0.166 per cent; coefficient of purity, 58.

*Number 45.*—Beets grown by Lawrence Meracle, Republican City, Harlan county, Nebraska; variety, Vilmorin; one-eighth of an acre planted; seeds sown June 3, 1889; clay soil; hoed several times; harvested October 12, 1889; analyzed October 24, 1889. Gross weight of beet, 728 grms. (about 1 lb. 9 oz.); net weight, 672 grms. (about 1 lb. 7 oz.); specific gravity of juice, 1.082; total solids, 19.3; sucrose, 8.54 per cent; glucose, 0.328 per cent; coefficient of purity, 44.

*Number 46.*—Beets grown by John Imhoff, Crete, Saline county, Nebraska; variety, Lane's Imperial; 120 beets raised; seed planted June 3, 1889; soil, light sandy loam; harvested October 14, 1889; analyzed October 22, 1889. Gross weight, 1940 grms. (about 4 lbs. 4 oz.); net weight, 1803 grms. (about 3 lbs. 15 oz.); specific gravity of juice, 1.080; total solids, 19.3; sucrose, 11.25 per cent; glucose, 0.166 per cent; coefficient of purity, 58.

*Number 47.*—Beets grown by Joseph Gass, Pilot, Custer county, Nebraska; variety, Vilmorin; planted May 24, 1889; soil, high, rolling land; cultivated same as corn; harvested October 8, 1889; analyzed October 22, 1889. Gross weight of beet, 1189 grms. (about 2 lbs. 9 oz.); net weight, 1149 grms. (about 2 lbs. 7 oz); specific gravity of juice, 1.091; total solids, 21.5; sucrose, 14.42 per cent; glucose, 0.114 per cent; coefficient of purity, 67.

*Number 48.*—Beets grown by Henry Nagle, Chicago, Antelope county, Nebraska; variety, Lane's Imperial; one-sixteenth of acre planted; seed sown May 13, 1889; soil, black sandy loam; beets were hoed and cultivated; harvested October 10, 1889; analyzed November 21, 1889. Gross weight of beet, 660 grms. (about 1 lb. 7 oz.); net weight, 640 grms. (about 1 lb. 5 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 22.08 per cent; glucose, 0.380 per cent; coefficient of purity, 93.

*Number 49.*—Beets grown by W. H. Kelly, Germantown, Seward county, Nebraska; variety, Vilmorin; planted May 18, 1889; soil, sandy loam; seeds were planted in drills, the beets were cultivated by hoeing; harvested October 11, 1889; analyzed November 19, 1889. Gross weight of beet, 1300 grms. (about 2 lbs. 13 oz.); net weight, 1240 grms. (about 2 lbs. 11 oz.); specific gravity of juice, 1.060; total solids, 14.7; sucrose, 4.51 per cent; glucose, 0.178 per cent; coefficient of purity, 30.

*Number 50.*—Beets grown by L. A. Ganson, Lodge Pole, Cheyenne county, Nebraska; one-sixteenth of an acre planted; seed sown May 31, 1889; soil, dark sandy loam; plants were in rows 14 inches apart; cultivated by hoeing; harvested October 7, 1889; yield, two bushels; analyzed November 5, 1889. Gross weight of beet, 2450 grms. (about 5 lbs. 5 oz.); net weight, 2330 grms. (about 5 lbs. 3 oz.); specific gravity of juice, 1.110; total solids, 23.7; sucrose, 16.22 per cent; glucose, 0.227 per cent; coefficient of purity, 68.

*Number 51.*—Beets grown by W. R. Hutchinson, Pawnee, Pawnee county, Nebraska; variety, Vilmorin; planted May 15, 1889; soil, sandy loam; cultivated by hoeing; harvested October 14, 1889; analyzed October 24, 1889. Gross weight of beet, 961 grms. (about 2 lbs. 1 oz.); net weight, 891 grms. (about 1 lb. 15 oz.); specific gravity of juice, 1.073; total solids, 17.7; sucrose, 7.21 per cent; glucose, 0.460 per cent; coefficient of purity, 41.

*Number 52.*—Beets grown by M. F. Wood, La Platte, Sarpy county, Nebraska; variety, Vilmorin; one-eighth of an acre planted; seed planted May 11, 1889; soil, black loam; cultivated by hoeing; harvested October 12, 1879; analyzed October 24, 1889. Gross weight of beet, 1032 grms. (about 2 lbs. 4 oz.); net weight, 990 grms. (about 2 lbs. 2 oz.); specific gravity of juice, 1.083; total solids, 19.3; sucrose, 11.27 per cent; glucose, 0.096 per cent; coefficient of purity, 58.

*Number 53.*—Beets grown by J. Legget, Platte Center, Platte county, Nebraska; variety, Vilmorin; planted May 15, 1889; soil, brown loam; cultivated by hoeing; harvested October 14, 1889; analyzed October 23, 1889. Gross weight of beet, 1745 grms. (about 3 lbs. 13 oz.); net weight, 1670 grms. (about 3 lbs. 10 oz.); specific gravity of juice, 1.080; total solids, 19; sucrose, 9.24 per cent; glucose, 0.054 per cent; coefficient of purity, 49.

*Number 54.*—Beets grown by B. Thompson, Swanton, Saline county, Nebraska; variety, Lane's Imperial; planted last of May, 1889; soil, black loam; cultivated with the cultivator; harvested October 1, 1889; analyzed October 23, 1889. Gross weight of beet, 2120 grms. (about 4 lbs. 10 oz.); net weight, 1970 grms. (about 4 lbs. 5 oz.); specific gravity of juice, 1.079; total solids, 19.2; sucrose, 9.23 per cent; glucose, 0.543 per cent; coefficient of purity, 48.

*Number 55.*—Beets grown by Philo Eddy, Inavale, Webster county, Nebraska; variety, Vilmorin; one-fourth of an acre planted; seed planted May 6, 1889; soil, black clay loam; cultivated by hoeing; harvested October 14, 1889; analyzed October 23, 1889. Gross weight of beet, 5895 grms. (about 12 lbs. 15 oz.); net weight, 5754 grms. (about 12 lbs. 6 oz.); specific gravity of juice, 1.088; total solids, 19.4; sucrose, 9.69 per cent; glucose, 0.080 per cent; coefficient of purity, 50.

*Number 55a.*—Beets grown by G. W. Clark, Alliance, Box Butte county, Nebraska; variety, Vilmorin; planted May 16, 1889; soil, black, sandy loam; cultivated with the hoe; harvested October 14, 1889; analyzed October 23, 1889. Gross weight of beet, 454 grms. (about 15 oz.); net weight, 424 grms. (about 14 oz.); specific gravity of juice, 1.110; total solids, 23.7; sucrose, 18.94 per cent; glucose, 0.099 per cent; coefficient of purity, 80.

*Number 56.*—Beets grown by G. B. Campbell, Pender, Dakota county, Nebraska; variety, Vilmorin; two square rods of ground planted; seed planted May 20, 1889; soil, black loam; cultivation same as for corn; harvested October 9, 1889; analyzed November 5, 1889. Gross weight of beet, 3090 grms. (about 6 lbs. 12 oz.); net weight, 2820 grms. (about 6 lbs. 3 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 7.43 per cent; glucose, 0.560 per cent; coefficient of purity, 32.

*Number 57.*—Beets grown by E. E. Adams, Mentorville, Antelope county, Nebraska; variety, Vilmorin; planted May 15, 1889; soil, light, sandy loam; cultivated with the hoe; harvested October 10, 1889; analyzed November 19, 1889. Gross weight of beet, 535 grms. (about 1 lb. 2 oz.); net weight, 515 grms. (about 1 lb. 1 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 18.48 per cent; glucose, 0.035 per cent; coefficient of purity, 78.

*Number 58.*—Beets grown by George N. D. Bear, Orleans, Harlan county, Nebraska; one square rod of land planted; seed sown last of May, 1889; soil, bottom land; cultivated by hoeing; harvested October 18, 1889; analyzed November 5, 1889. Gross weight of beet, 2420 grms. (about 5 lbs. 4 oz.); net weight, 2210 grms. (about 4 lbs. 14 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 5.91 per cent; glucose, 0.520 per cent; coefficient of purity, 25.

*Number 59.*—Beets grown by William Tweede, Bassett, Keya Paha county, Nebraska; seed planted May 25, 1889; soil, sandy loam; crop hoed twice; harvested October 3, 1889; analyzed November 5, 1889. Gross weight of beet, 995 grms. (about 2 lbs. 3 oz.); net weight, 900 grms. (about 1 lb. 15 oz.); specific gravity of juice, 1.061; total solids, 14.7; sucrose, 11.26 per cent; glucose, 0.312 per cent; coefficient of purity, 77.

*Number 60.*—Beets grown by W. O. Coe, Orleans, Harlan county, Nebraska; planted May 10, 1889; soil, creek bottom; seeds were planted in rows and cultivated; harvested October 10, 1889; analyzed November 5, 1889. Gross weight of beet, 3170 grms. (about 6 lbs. 15 oz.); net weight, 3040 grms. (about 6 lbs.); specific gravity of juice, 1.080; total solids, 19.3; sucrose, 6.30 per cent; glucose, 0.145 per cent; coefficient of purity, 33.

*Number 61.*—Beets grown by R. L. Grosvenor, Hoskins, Wayne county, Nebraska; variety, Vilmorin; seed planted May 25, 1889; soil, sandy loam; cultivated by hoeing; harvested September 25, 1889; analyzed November 5, 1889. Gross weight of beet, 1430 grms. (about 3 lbs. 2 oz.); net weight, 1380 grms. (about 3 lbs.); specific gravity of juice, 1.090; total solids, 21.5; sucrose, 6.44 per cent; glucose, 0.590 per cent; coefficient of purity, 30.

*Number 62.*—Beets grown by Jacob Beaver, Leonie, Holt county, Nebraska; seed planted May 15, 1889; soil, sandy loam; harvested October 29, 1889; analyzed November 25, 1889. Gross weight of beet, 675 grms. (about 1 lb. 7 oz.); net weight, 610 grms. (about 1 lb. 4 oz.); specific gravity of juice, 1.110; total solids, 23.7; sucrose, 13.52 per cent; glucose, 0.540 per cent; coefficient of purity, 57.

Second analysis, November 25, 1889. Gross weight of beet, 810 grms. (about 1 lb. 12 oz.); net weight, 750 grms. (about 1 lb. 10 oz.); specific gravity of juice, 1.10; total solids, 23.7; sucrose, 16.90 per cent; glucose, 0.540 per cent; coefficient of purity, 71.

*Number 63.*—Beets raised by S. R. Smith, Wabash, Cass county, Nebraska; variety, Vilmorin; raised twenty-three beets; soil, black loam; cultivated with the hoe and cultivator; harvested October 15, 1889; analyzed November 25, 1889. Gross weight of beet, 1620 grms. (about 3 lbs. 8 oz.); net weight, 1540 grms. (about 3 lbs. 4 oz.); specific gravity of juice, 1.080; total solids, 19.3; sucrose, 6.76 per cent; glucose, 0.220 per cent; coefficient of purity, 35.

*Number 64.*—Beets raised by Edward Arnold, Odell, Gage county, Nebraska; seed planted May 15, 1889; soil, sandy loam; cultivated by hoeing; harvested October 26, 1889; analyzed November 6, 1889. Gross weight of beet, 2710 grms. (about 5 lbs. 15 oz.); net weight, 2560 grms. (about 5 lbs. 10 oz.); specific gravity of juice, 1.060; total solids, 14.7; sucrose, 2.26 per cent; glucose, 0.500 per cent; coefficient of purity, 17.

*Number 65.*—Beets grown by J. B. Mowrer, Aurora, Hamilton county, Nebraska; variety, Vilmorin; thirteen square rods of land planted; seed sown June 1, 1889; soil, light; cultivation, same as for corn; harvested last of October, 1889; analyzed November 21, 1889. Gross weight of beet, 1450 grms. (about 3 lbs. 3 oz.); net weight, 1395 grms. (about 3 lbs.); specific gravity of juice, 1.050; total solids, 12.4; sucrose, 8.57 per cent; glucose, 0.190 per cent; coefficient of purity, 70.

*Number 66.*—Beets grown by John Daw, Scottsville, Holt county, Nebraska; variety, Lane's Imperial; seed planted May 28, 1889; soil, sandy loam; beets were cultivated and hoed; harvested October 15, 1889; analyzed November 19, 1889. Gross weight of beet, 1720 grms. (about 3 lbs. 12 oz.); net weight, 1650 grms. (about 3 lbs. 10 oz.); specific gravity of juice, 1.090; total solids, 21.5; sucrose, 8.34 per cent; glucose, 0.140 per cent; coefficient of purity, 39.

*Number 67.*—Beets grown by G. W. Alexander, Milligan, Saline county, Nebraska; variety, Vilmorin; planted June 1, 1889; soil, common prairie; cultivated with the hoe; harvested October 25, 1889; analyzed November 19, 1889. Gross weight of beet, 1700 grms. (about 3 lbs. 12 oz.); net weight, 1640 grms. (about 3 lbs. 9 oz.); specific gravity of juice, 1.081; total solids, 20.4; sucrose, 8 34 per cent; glucose, 0.082 per cent; coefficient of purity, 41.

Second analysis, November 19, 1889. Gross weight of beet, 1820 grms. (about 4 lbs.); net weight, 1760 grms. (about 3 lbs. 13 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 6.76 per cent; glucose, 0.160 per cent; coefficient of purity, 29.

Third analysis, November 19, 1889. Gross weight of beet, 1665 grms. (about 3 lbs. 10 oz.); net weight, 1602 grms. (about 3 lbs. 8 oz.); specific gravity of juice, 1.080; total solids, 20.4; sucrose, 8.34 per cent; glucose, 0.270 per cent; coefficient of purity, 41.

*Number 68.*—Beets grown by C. D. Emerson, Norman, Kearney county, Nebraska; variety, Lane's Imperial; planted May 17, 1889; soil, prairie; beets were cultivated and hoed; harvested October 1, 1889; analyzed November 25, 1889. Gross weight of beet, 1675 grms. (about 3 lbs. 10 oz.); net weight, 1550 grms. (about 3 lbs. 6 oz.); specific gravity of juice, 1.100; total solids, 23.7; sucrose, 10.81 per cent; glucose, 0.220 per cent; coefficient of purity, 46.

Second analysis, November 25, 1889. Gross weight of beet, 3150 grms. (about 9 lbs. 14 oz.); net weight, 2930 grms. (about 6 lbs. 7 oz.); specific gravity of juice, 1.090; total solids, 21.5; sucrose, 9.24 per cent; glucose, 0.240 per cent; coefficient of purity, 43.

*Number 69.*—Beets grown by Joseph Lamb, Hubbel, Thayer county, Nebraska; variety, Vilmorin; planted May 23, 1889; soil, black loam; cultivated by hoeing and weeding; harvested November 4, 1889; analyzed, November 21, 1889. Gross weight of beet, 1330 grms. (about 2 lbs. 11 oz.); net weight, 1296 grms. (about 2 lbs. 9 oz.); specific gravity of juice, 1.060; total solids, 14.7; sucrose, 8.44 per cent; glucose, 0.200 per cent; coefficient of purity, 56.

*Number 70.*—Beets grown by H. S. Caswell, Neligh, Antelope county, Nebraska; variety, Vilmorin; four square rods of ground planted; seed sown June 1, 1889; soil, sandy loam; cultivated by hoeing; harvested October 19, 1889; analyzed November 29, 1889. Gross weight of beet, 765 grms. (about 1 lb. 10 oz.); net weight, 740 grms. (about 1 lb. 9 oz.); specific gravity of juice, 1.110; total solids, 23.7; sucrose, 16.90 per cent; glucose, 0.190 per cent; coefficient of purity, 72.

*Number 71.*—Beets grown at Minden, Kearney county, Nebraska. No data given; the analysis was made December 21, 1889; beet had sprouted considerably. Gross weight of beet, 734 grms. (about 1 lb. 9 oz.); net weight, 702 grms. (about 1 lb. 7 oz.); total solids, 12.4; specific gravity of juice, 1.050; sucrose, 3.37 per cent; glucose, 0.223 per cent; coefficient of purity, 27.

*Number 72.*—Beets grown at Minden, Kearney county, Nebraska; no data; analysis made December 21, 1889. Gross weight of beet, 1522 grms. (about 3 lbs. 5. oz.); net weight, 1490 grms. (about 3 lbs. 3 oz.); specific gravity of juice, 1.080; total solids, 19.3; sucrose, 7.44 per cent; glucose, 0.409; coefficient of purity, 38.

*Number 73*—Beets from Minden; analyzed December 21, 1889. Gross weight of beet, 755 grms. (about 1 lb. 10 oz.); net weight, 735 grms. (about 1 lb. 8 oz.); specific gravity of juice, 1.081; total solids, 19.3; sucrose, 13.52 per cent; glucose, 0.450 per cent; coefficient of purity, 70.

*Number 74.*—Beets from Minden, Kearney county, Nebraska; no data; beet sprouts two inches and more in length; analyzed December 21, 1889. Gross weight of beet, 1318 grms. (about 2 lbs. 13 oz.); net weight, 1242 grms. (about 2 lbs. 13 oz.); specific gravity of juice, 1.080; total solids, 19.3; sucrose, 8.78 per cent; glucose, 0.105 per cent; coefficient of purity, 45.

*Number 75.*—Beets from Minden; no data; analyzed December 31, 1889. Gross weight of beet, 496 grms. (1 lb. 1 oz.); net weight, 488 grms. (about 1 lb.); specific gravity of juice, 1.110; total solids, 23.7; sucrose, 15.09; glucose, 0.125; coefficient of purity, 64.

*Number 76.*—No data; analyzed January 3, 1890. Gross weight of beet, 1095 grms. (about 2 lbs. 6 oz.); net weight, 1015 grms. (about 2 lbs. 4 oz.); specific gravity of juice, 1.080; total solids, 19.3; sucrose, 14.42 per cent; glucose, 0.176 coefficient of purity, 74.

*Number 77.*—No data; analyzed January 3, 1890. Gross weight of beet, 607 grms. (about 1 lb. 5 oz.); net weight, 585 grms. (about 1 lb. 4 oz.); specific gravity of juice, 1.110; total solids, 23.7; sucrose, 12.56 per cent; glucose, 0.111 per cent; coefficient of purity, 53.

*Number 78.*—No data; analyzed January 3, 1890. Gross weight of beet, 580 grms. (about 1 lb. 4 oz.); net weight, 555 grms. (about 1 lb. 3 oz.); specific gravity of juice, 1.110; total solids, 23.7; sucrose, 21.86 per cent; glucose, 0.109 per cent; coefficient of purity, 92.

*Number 79.*—Beets grown by L. H. Jewett, Broken Bow, Custer county, Nebraska; no further data received; beets were analyzed October 16, 1889. Gross weight of beet, 1070 grms. (about 2 lbs. 5 oz.); net weight, 1030 grms. (about 2 lbs. 3 oz.); specific gravity of juice, 1.090; total solids, 21.5; sucrose, 12.17 per cent; glucose, 0.125 per cent; coefficient of purity, 57.

In order to bring the facts here recorded into such relations with each other as to admit of ready comparison, the table on pages 324–329 has been prepared.

## EXPLANATION OF TABLE.

The terms used in the table, in the main, explain themselves.

In the column headed "Season," under each month occur the letters "T.," "R.," and "R. D.;" in column "T." is recorded the average or mean temperature for the month; under "R." is the average rainfall in inches for the month, while "R. D." gives the number of rainy days occurring in that month.

In the column "Total solids" is written the entire amount of solid matter, sugar and other substances, in 100 parts of the juice.

Under "Per cent of sugar" are two columns: the one, "Sucrose;" the other, "Glucose." The figures indicate the amount of each in 100 parts of juice.

By sucrose is meant our ordinary crystallizable sugar; by glucose, we mean a less sweet, and, ordinarily, non-crystallizable sugar.

In the column marked "Purity" is recorded the percentage of sucrose in the entire amount of solid matter in the juice.

To illustrate: beet number 130, grown by Henry Nagle, Antelope county, gives the following record: total solids, 23.7; sucrose, 22.08; glucose, 0.38; purity, 93. This means that in every 100 parts of the juice of this beet there were 23.7 parts of solid matter.

This solid matter is composed of—

| | |
|---|---|
| Sucrose | 22.08 parts. |
| Glucose | 0.38 parts. |
| Solids (not sugar) | 1.24 parts. |
| Total | 23.70 parts. |

That is, 93 per cent of all the solids is sucrose.

This table gives the analyses of 166 beets grown in thirty-seven counties of the state, representing all sections, from the extreme southeast to the extreme northwest, and from the northeast to the southwest. The Vilmorin and Lane's Imperial were the two varieties of seed usually planted. The time of planting ranges from April 4, 1889, to June 15, the majority of the planting being done in the early part of May, and the harvesting in October. In almost all cases the soil is a variety of loam. Judging from the data given, but little attention has been paid to the matter of cultivation.

## SEASON.

The season of 1889, considering the entire state, as is shown by comparing the somewhat meagre data in this table with the average of a number of years, has not been unfavorable; May and June were warm and moist; the rise of temperature in July and August was accompanied by an increased rainfall, which rainfall decreased again with the fall of the temperature in September.*

While the conditions essential to the successful culture of beets for sugar are many and various, the most important factor is that of climate, as this is incapable of modification by human agencies. For this reason it is desirable, at the outset, to determine its value, that we may know whether or not it is with us a dominating factor in the summing up of conclusions deduced from experiment. Knowledge upon this point may prevent a great waste of time, energy, and money in carrying out experiments that might be fruitless, or it may be a guide in determining what modifications or less inflexible factors may be necessary.

In the older countries, where the beet-sugar industry has been successfully established, the climate factor has been thoroughly studied, and its influence there determined; the facts thus obtained may not be an absolute guide in the attempt to introduce the industry into a new region, yet it is very desirable to know the limiting conditions wherever success has been obtained.

We quote a most valuable summary of European conditions from Professor Wm. McMurtrie's special report to the Department of Agriculture: †

"The amount of moisture at the disposition of the plant at all seasons of its growth is the most important factor in its normal development that will affect, to any marked extent, the quantity and quality of the crop, and consequently the existence and progress of this culture.

"Temperature has an influence, it is true, but, except it be too low, it has not the power for evil that deficiency of moisture may have, and we have nothing to fear concerning too low a temperature during the growing season in the United States. In fact, the plant is more likely to suffer from too high a temperature during the summer months than from a deficiency of heat.

"In determining whether a section be favorable to the culture, it is, of course, of importance to note whether the temperature is sufficiently high to insure the development of the plant, and, after this, note must be taken of the rainfall with which the section is favored during each month. It is not sufficient to know that the quantity is equal to or above a certain average, but that it must be regularly supplied, and also that the temperature is not sufficiently high to evaporate it before it can be made use of by the plant.

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* See chart, page 333.

† Special report, number 28.

TABLE

| *Serial number.* | GROWER. | POSTOFFICE ADDRESS. | *Variety of beets grown.* | *Time of planting.* | *Time of harvesting.* | *Kind of soil.* |
|---|---|---|---|---|---|---|
| 7 | J. G. Smith | Lincoln, Lancaster county | Vilmorin | April 4, '89 | Aug. 6, '89 | Black loam |
| 8 | J. G. Smith | Lincoln, Lancaster county | Vilmorin | April 4, '89 | Sept. 5, '89 | Black loam |
| 9 | J. G. Smith | Lincoln, Lancaster county | Vilmorin | April 4, '89 | Sept. 20, '89 | Black loam |
| 10 | J. G. Smith | Lincoln, Lancaster county | Vilmorin | April 4, '89 | Oct. 14, '89 | Black loam |
| 11 | J. G. Smith | Lincoln, Lancaster county | Vilmorin | April 4, '89 | Oct. 21, '89 | Black loam |
| 12 | J. G. Smith | Lincoln, Lancaster county | Vilmorin | April 4, '89 | Oct. 25, '89 | Black loam |
| 13 | J. G. Smith | Lincoln, Lancaster county | Vilmorin | April 4, '89 | Oct. 26, '89 | Black loam |
| 14 | J. G. Smith | Lincoln, Lancaster county | Vilmorin | April 4, '89 | Nov. 4, '89 | Black loam |
| 15 | J. G. Smith | Lincoln, Lancaster county | Vilmorin | April 4, '89 | Nov. 11, '89 | Black loam |
| 16 | J. G. Smith | Lincoln, Lancaster county | Vilmorin | April 4, '89 | Nov. 17, '89 | Black loam |
| 17 | J. G. Smith | Lincoln, Lancaster county | Percy's White | May 3, '89 | Aug. 6, '89 | Black loam |
| 18 | J. G. Smith | Lincoln, Lancaster county | Percy's White | May 3, '89 | Sept. 20, '89 | Black loam |
| 19 | J. G. Smith | Lincoln, Lancaster county | Percy's White | May 3, '89 | Oct. 5, '89 | Black loam |
| 20 | J. G. Smith | Lincoln, Lancaster county | Percy's White | May 3, '89 | Oct. 14, '89 | Black loam |
| 21 | J. G. Smith | Lincoln, Lancaster county | Percy's White | May 3, '89 | Oct. 21, '89 | Black loam |
| 22 | J. G. Smith | Lincoln, Lancaster county | Percy's White | May 3, '89 | Oct. 25, '89 | Black loam |
| 23 | J. G. Smith | Lincoln, Lancaster county | Percy's White | May 3, '89 | Oct. 29. '89 | Black loam |
| 24 | J. G. Smith | Lincoln, Lancaster county | Percy's White | May 3, '89 | Nov. 4, '89 | Black loam |
| 25 | J. G. Smith | Lincoln, Lancaster county | Percy's White | May 3, '89 | Nov. 11, '89 | Black loam |
| 26 | J. G. Smith | Lincoln, Lancaster county | Percy's White | May 3, '89 | Nov. 17, '89 | Black loam |
| 27 | J. G. Smith | Lincoln, Lancaster county | Lane's Imp'l | April 19, '89 | Aug. 6, '89 | Black loam |
| 28 | J. G. Smith | Lincoln, Lancaster county | Lane's Imp'l | April 19, '89 | Sept. 20, '89 | Black loam |
| 29 | J. G. Smith | Lincoln, Lancaster county | Lane's Imp'l | April 19, '89 | Oct. 4, '89 | Black loam |
| 30 | J. G. Smith | Lincoln, Lancaster county | Lane's Imp'l | April 19, '89 | Oct. 14, '89 | Black loam |
| 31 | J. G. Smith | Lincoln, Lancaster county | Lane's Imp'l | April 19, '89 | Oct. 21, '89 | Black loam |
| 32 | J. G. Smith | Lincoln, Lancaster county | Lane's Imp'l | April 19, '89 | Oct. 26, '89 | Black loam |
| 33 | J. G. Smith | Lincoln, Lancaster county | Lane's Imp'l | April 19, '89 | Oct. 29, '89 | Black loam |
| 34 | J. G. Smith | Lincoln, Lancaster county | Lane's Imp'l | April 19, '89 | Nov. 4, '89 | Black loam |
| 35 | J. G. Smith | Lincoln, Lancaster county | Lane's Imp'l | April 19, '89 | Nov. 11, '89 | Black loam |
| 36 | J. G. Smith | Lincoln, Lancaster county | Lane's Imp'l | April 19, '89 | Nov. 17, '89 | Black loam |
| 37 | J. G. Smith | Lincoln, Lancaster county | White Sugar | May 2, '89 | Aug. 6, '89 | Black loam |
| 38 | J. G. Smith | Lincoln, Lancaster county | White Sugar | May 2, '89 | Sept. 5, '89 | Black loam |
| 39 | J. G. Smith | Lincoln, Lancaster county | White Sugar | May 2, '89 | Sept. 20, '89 | Black loam |
| 40 | J. G. Smith | Lincoln, Lancaster county | White Sugar | May 2, '89 | Oct. 7, '89 | Black loam |
| 41 | J. G. Smith | Lincoln, Lancaster county | White Sugar | May 2, '89 | Oct. 14, '89 | Black loam |
| 42 | J. G. Smith | Lincoln, Lancaster county | White Sugar | May 2, '89 | Oct. 21, '89 | Black loam |
| 43 | J. G. Smith | Lincoln, Lancaster county | White Sugar | May 2, '89 | Oct. 26, '89 | Black loam |
| 44 | J. G. Smith | Lincoln, Lancaster county | White Sugar | May 2, '89 | Nov. 4, '89 | Black loam |
| 45 | J. G. Smith | Lincoln, Lancaster county | White Sugar | May 2, '89 | Nov. 11, '89 | Black loam |
| 46 | J. G. Smith | Lincoln, Lancaster county | White Sugar | May 2, '89 | Nov. 17, '89 | Black loam |
| 47 | R. W. Furnas | Brownville, Nemaha county | Vilmorin | May 1, '89 | Nov. 8, '89 | Black loam |
| 48 | R. W. Furnas | Brownville, Nemaha county | Vilmorin | May 1, '89 | Nov. 8, '89 | Black loam |
| 49 | R. W. Furnas | Brownville, Nemaha county | Vilmorin | May 1, '89 | Nov. 8, '89 | Black loam |
| 50 | R. W. Furnas | Brownville, Nemaha county | Vilmorin | May 1, '89 | Nov. 8, '89 | Black loam |
| 51 | R. W. Furnas | Brownville, Nemaha county | Vilmorin | May 1, '89 | Nov. 8, '89 | Black loam |
| 52 | Charles Redfield | Max, Dundy county | Vilmorin | May 3, '89 | Oct. 16, '89 | Rich loam |
| 53 | Charles Redfield | Max, Dundy county | Vilmorin | May 3, '89 | Oct. 16, '89 | Rich loam |
| 54 | Charles Redfield | Max, Dundy county | Vilmorin | May 3, '89 | Oct. 16, '89 | Rich loam |
| 55 | Charles Redfield | Max, Dundy county | Vilmorin | May 3, '89 | Oct. 16, '89 | Rich loam |
| 56 | Col. A. V. Kautz | Fort Niobrara, Cherry county | Imprv'd Imp'l | May 20, '89 | Oct. 3, '89 | Loam |
| 57 | Col. A. V. Kautz | Fort Niobrara, Cherry county | Vilmorin | May 20, '89 | Oct. 3, '89 | Loam |
| 58 | Col. A. V. Kautz | Fort Niobrara, Cherry county | | May 20, '89 | Oct. 3, '89 | Loam |
| 59 | Col. A. V. Kautz | Fort Niobrara, Cherry county | | May 20, '89 | Oct. 3, '89 | Loam |
| 60 | Dr. F. Verges | Norfolk, Madison county | Silesian | May —, '89 | Nov. 6, '89 | Dark clay |
| 61 | Dr. F. Verges | Norfolk, Madison county | Silesian | May —, '89 | Nov. 6, '89 | Dark clay |
| 62 | Dr. F. Verges | Norfolk, Madison county | Silesian | May —, '89 | Nov. 6, '89 | Dark clay |
| 63 | Dr. F. Verges | Norfolk, Madison county | Silesian | May —, '89 | Nov. 6, '89 | Dark clay |
| 64 | T. H. Marsland | Lincoln, Lancaster county | Vilmorin | May 15, '89 | Oct. 15, '89 | Sandy loam |
| 65 | W. H. Reynolds | Chadron, Dawes county | | May 20, '89 | Sept. 15, '89 | Sandy loam |
| 66 | W. H. Reynolds | Chadron, Dawes county | | May 20, '89 | Sept. 15, '89 | Sandy loam |
| 67 | W. H. Reynolds | Chadron, Dawes county | | May 20, '89 | Sept. 15, '89 | Sandy loam |
| 68 | W. H. Reynolds | Chadron, Dawes county | | May 20, '89 | Sept. 15, '89 | Sandy loam |
| 69 | Daniel Hubbard | Valentine, Cherry county | Vilmorin | May 15, '89 | Oct. 19, '89 | Sandy loam |
| 70 | Daniel Hubbard | Valentine, Cherry county | Vilmorin | May 15, '89 | Oct. 19, '89 | Sandy loam |
| 71 | Daniel Hubbard | Valentine, Cherry county | Vilmorin | May 15, '89 | Oct. 19, '89 | Sandy loam |
| 72 | A. B. Perkins | Grand Island, Hall county | | | | |

**NO. I.**

| *Amount of cultivation.* | Season. | | | | | | | | | | | | | | | Wt. of beet. | | *Total solids* | Per cent of sugar. | | *Purity* | *Serial number* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *May.* | | | *June.* | | | *July.* | | | *August.* | | | *September.* | | | *Pounds* | *Ounces* | | *Sucrose* | *Glucose* | | |
| | T. | R. | R. D. | T. | R. | R. D. | T. | R. | R. D. | T. | R. | R. D. | T. | R. | R. D. | | | | | | | |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 2 | 4 | ...... | 11.40 | ......... | ...... | 7 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 3 | ...... | ...... | 2.25 | ......... | ...... | 8 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 3 | 4 | ...... | 2.25 | ......... | ...... | 9 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 2 | ...... | 12.4 | 5.14 | 0.312 | 41+ | 10 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 1 | 9 | 19.3 | 9.22 | 0.137 | 48 | 11 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 2 | ...... | 12.4 | 5.63 | 0.277 | 45+ | 12 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 2 | 15 | 14.7 | 7.21 | 0.608 | 49 | 13 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 1 | 14 | 20.6 | 4.73 | 0.403 | 20 | 14 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 2 | 7 | 10.0 | 4.95 | 0.423 | 42+ | 15 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 2 | ...... | 14.7 | 4.95 | 0.213 | 34 | 16 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 3 | 6 | 10.4 | 6.98 | ......... | 67 | 17 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 3 | 15 | 7.8 | 4.50 | ......... | 58 | 18 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 2 | 2 | 19.3 | 9.46 | 0.226 | 49 | 19 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 1 | 8 | 17.0 | 9.01 | 0.056 | 53 | 20 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 2 | 12 | 16.5 | 8.34 | 0.105 | 50 | 21 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 4 | 12 | 15.2 | 6.75 | 0.119 | 44+ | 22 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 3 | 13 | 18.0 | 9.01 | 0.166 | 50 | 23 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 2 | 4 | 19.3 | 4.96 | 0.176 | 26 | 24 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 4 | ...... | 21.5 | 4.96 | 0.290 | 23+ | 25 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 2 | 15 | 17.0 | 2.25 | ......... | 13+ | 26 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 6 | 2 | 14.7 | 8.11 | ......... | 55 | 27 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 3 | ...... | 13.3 | 2.03 | 0.112 | 15 | 28 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 3 | 2 | 12.4 | 6.81 | 0.226 | 54+ | 29 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 3 | 2 | 12.9 | 4.28 | 0.146 | 33+ | 30 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 3 | 7 | 12.4 | 5.14 | 0.134 | 41+ | 31 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 3 | 15 | 12.4 | 6.08 | 0.220 | 49 | 32 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 2 | 7 | 12.4 | 2.50 | 0.112 | 20 | 33 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 2 | 4 | 19.1 | 6.52 | 0.340 | 34 | 34 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 3 | 4 | 12.4 | 3.48 | 0.268 | 28 | 35 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 1 | 2 | 17.0 | 4.96 | 0.254 | 29 | 36 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 2 | 8 | 10.7 | 7.66 | 0.131 | 71 | 37 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 4 | 2 | 12.4 | 5.18 | 0.185 | 41 | 38 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 4 | 12 | 13.1 | 4.50 | ......... | 34 | 39 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 2 | 15 | 15.9 | 6.31 | 0.008 | 40 | 40 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 2 | ...... | 19.7 | 9.01 | 0.165 | 46 | 41 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 3 | 7 | 17.0 | 7.66 | 0.070 | 45 | 42 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 3 | 3 | 10.0 | 5.64 | 0.481 | 56 | 43 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 3 | 10 | 23.7 | 6.08 | 0.100 | 26 | 44 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 2 | 8 | 23.7 | 9.01 | 0.117 | 40 | 45 |
| Cultivated and hoed.. | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 3 | 10 | 14.7 | 2.25 | ......... | 15 | 46 |
| Cultivated.................. | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 3 | 21.5 | 13.97 | 0.011 | 65 | 47 |
| Cultivated.................. | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 2 | 9 | 23.7 | 15.55 | 0.101 | 65 | 48 |
| Cultivated.................. | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 4 | ...... | 23.7 | 15.77 | 0.803 | 67 | 49 |
| Cultivated.................. | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 2 | 7 | 23.7 | 17.17 | 0.180 | 72 | 50 |
| Cultivated.................. | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 2 | 4 | 23.7 | 20.28 | 0.158 | 86 | 51 |
| Cultivated.................. | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 2 | ...... | 21.5 | 15.77 | 0.200 | 73 | 52 |
| Cultivated.................. | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 6 | 23.6 | 14.19 | 0.140 | 60 | 53 |
| Cultivated.................. | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 9 | 23.7 | 17.57 | 0.109 | 75 | 54 |
| Cultivated.................. | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 2 | 2 | 23.7 | 16.22 | 0.012 | 69 | 55 |
| Hoed........................ | 54.0 | 2.05 | 12 | 66.0 | 2.99 | 10 | 71.6 | 2.60 | 8 | 73.0 | 0.34 | 6 | 58.4 | 1.71 | 11 | 3 | 8 | 23.7 | 10.99 | 0.150 | 47 | 56 |
| Hoed........................ | 54.0 | 2.05 | 12 | 66.0 | 2.99 | 10 | 71.6 | 2.60 | 8 | 73.0 | 0.34 | 6 | 58.4 | 1.71 | 11 | 1 | 10 | 23.7 | 14.65 | 0.370 | 62 | 57 |
| Hoed........................ | 54.0 | 2.05 | 12 | 66.0 | 2.99 | 10 | 71.6 | 2.60 | 8 | 73.0 | 0.34 | 6 | 58.4 | 1.71 | 11 | 1 | ...... | 23.7 | 20.28 | 0.025 | 86 | 58 |
| Hoed........................ | 54.0 | 2.05 | 12 | 66.0 | 2.99 | 10 | 71.6 | 2.60 | 8 | 73.0 | 0.34 | 6 | 58.4 | 1.71 | 11 | 1 | 7 | 23.7 | 16.00 | 0.180 | 70 | 59 |
| Hoed........................ | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 5 | 23.7 | 10.14 | 0 146 | 43 | 60 |
| Hoed........................ | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 2 | 8 | 23.7 | 8.34 | 0.304 | 45 | 61 |
| Hoed........................ | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 5 | 23.7 | 8.34 | 0.277 | 45 | 62 |
| Hoed........................ | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 3 | 8 | 23.7 | 10.14 | 0.423 | 43 | 63 |
| Hoed........................ | 61.0 | 2.20 | 8 | 69.0 | 2.93 | 9 | 73.0 | 5.16 | 9 | 70.0 | 4.40 | 6 | 63.0 | 2.41 | 5 | 3 | 15 | 17.0 | 9.01 | 0.094 | 53 | 64 |
| Weeded...................... | 53.4 | 2.55 | ... | 64.6 | 2.71 | ... | 70.5 | 2.67 | ... | 70.8 | 2.15 | ... | 58.3 | 0.38 | ... | 1 | 14 | 23.7 | 16.03 | 0.163 | 70 | 65 |
| Weeded...................... | 53.4 | 2.55 | ... | 64.6 | 2.71 | ... | 70.5 | 2.67 | ... | 70.8 | 2.15 | ... | 58.3 | 0.38 | ... | 2 | 1 | 21.5 | 9.24 | 0.096 | 43 | 66 |
| Weeded...................... | 53.4 | 2.55 | ... | 64.6 | 2.71 | ... | 70.5 | 2.67 | ... | 70.8 | 2.15 | ... | 58.3 | 0.38 | ... | 2 | 15 | 19.3 | 19 30 | 0.872 | 84 | 67 |
| Weeded...................... | 53.4 | 2.55 | ... | 64.6 | 2.71 | ... | 70.5 | 2.67 | ... | 70.8 | 2.15 | ... | 58.3 | 0.38 | ... | 1 | 11 | 18.1 | 12.61 | 0.154 | 70 | 68 |
| Cultivated.................. | 57.6 | 2.92 | 12 | 64.8 | 2.92 | 10 | 71.2 | 3.27 | 8 | 75.6 | 0.41 | 6 | 58.0 | 1.39 | 11 | 4 | 4 | 23.7 | 15.90 | 0.176 | 63 | 69 |
| Cultivated.................. | 57.6 | 2.92 | 12 | 64.8 | 2.92 | 10 | 71.2 | 3.27 | 8 | 75.6 | 0.41 | 6 | 58.0 | 1.39 | 11 | 4 | 8 | 23.7 | 12.62 | 0.098 | 53 | 70 |
| Cultivated.................. | 57.6 | 2.92 | 12 | 64.8 | 2.92 | 10 | 71.2 | 3.27 | 8 | 75.6 | 0.41 | 6 | 58.0 | 1.39 | 11 | 2 | 15 | 23.7 | 12.65 | 0.143 | 54 | 71 |
| ............................ | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | ...... | 23.7 | 14.14 | 0.101 | 51 | 72 |

TABLE NO.

| Serial number | GROWER. | POSTOFFICE ADDRESS. | *Variety of beets grown.* | *Time of planting.* | *Time of harvesting.* | *Kind of soil.* |
|---|---|---|---|---|---|---|
| 73 | A. B. Perkins | Grand Island, Hall county | | | | |
| 74 | A. B. Perkins | Grand Island, Hall county | | | | |
| 75 | A. B. Perkins | Grand Island, Hall county | | | | |
| 76 | A. B. Perkins | Grand Island, Hall county | | | | |
| 77 | H. T. J. Fuehrman | Grand Island, Hall county | Imperial | May 10, '89 | Sept. 25, '89 | Sandy loam |
| 78 | H. T. J. Fuehrman | Grand Island, Hall county | Am. Vilmorin, | May 10, '89 | Sept. 25, '89 | Sandy loam |
| 79 | H. T. J. Fuehrman | Grand Island, Hall county | Ger. Vilmorin, | June 15, '89, | Oct. 20, '89 | Sandy loam |
| 80 | H. T. J. Fuehrman | Grand Island, Hall county | Wanzleben | June 15, '89 | Oct. 20, '89 | Sandy loam |
| 81 | Rev. Hawkins | Wellfleet, Lincoln county | Vilmorin | May 15, '89 | Oct. 15, '89 | Sandy loam |
| 82 | Rev. Hawkins | Wellfleet, Lincoln county | Vilmorin | May 15, '89 | Oct. 15, '89 | Sandy loam |
| 83 | Rev. Hawkins | Wellfleet, Lincoln county | Vilmorin | May 15, '89 | Oct. 15, '89 | Sandy loam |
| 84 | Rev. Hawkins | Wellfleet, Lincoln county | Vilmorin | May 15, '89 | Oct. 15, '89 | Sandy loam |
| 85 | Rev. Hawkins | Wellfleet, Lincoln county | Vilmorin | May 15, '89 | Oct. 15, '89 | Sandy loam |
| 86 | Rev. Hawkins | Wellfleet, Lincoln county | Vilmorin | May 15, '89 | Oct. 15, '89 | Sandy loam |
| 87 | Rev. Hawkins | Wellfleet, Lincoln county | Vilmorin | May 15, '89 | Oct. 15, '89 | Sandy loam |
| 88 | Rev. Hawkins | Wellfleet, Lincoln county | Vilmorin | May 15, '89 | Oct. 15, '89 | Sandy loam |
| 89 | Rev. Hawkins | Wellfleet, Lincoln county | Vilmorin | May 15, '89 | Oct. 15, '89 | Sandy loam |
| 90 | C. B. Kemple | Hastings, Adams county | Vilmorin | May 1, '89 | | Sandy loam |
| 91 | H. C. Armstrong | Hastings, Adams county | Vilmorin | Apr. 22, '89 | Oct. 11, '87 | Sandy loam |
| 92 | S. M. Bates | Hastings, Adams county | | Apr. 23, '89 | Oct. 17, '89 | Sandy loam |
| 93 | W. M. Lowman | Hastings, Adams county | Vilmorin | May 15, '89 | Oct. 22, '89 | Clay |
| 94 | | Hastings, Adams county | Vilmorin | | | |
| 95 | | Hastings, Adams county | | | | |
| 96 | F. Bates | Hastings, Adams county | Vilmorin | | | |
| 97 | Mr. Rinker | Hastings, Adams county | Lane's Imp'l | May 10, '89 | Oct. 25, '89 | Sandy loam |
| 98 | S. G. Johnson | Hastings, Adams county | Vilmorin | June 1, '89 | | |
| 99 | W. W. Philleo | Ayr, Adams county | Vilmorin | June 1, '89 | | Sandy loam |
| 100 | W. W. Philleo | Ayr, Adams county | Vilmorin | June 1, '89 | | Sandy loam |
| 101 | W. W. Philleo | Ayr, Adams county | Vilmorin | June 1, '89 | | Sandy loam |
| 102 | W. W. Philleo | Ayr, Adams county | Vilmorin | June 1, '89 | | Sandy loam |
| 103 | W. W. Philleo | Ayr, Adams county | Lane's Imp'l | June 1, '89 | | Sandy loam |
| 104 | W. W. Philleo | Ayr, Adams county | Lane's Imp'l | June 1, '89 | | Sandy loam |
| 105 | W. W. Philleo | Ayr, Adams county | Lane's Imp'l | June 1, '89 | | Sandy loam |
| 106 | W. W. Philleo | Ayr, Adams county | Lane's Imp'l | June 1, '89 | | Sandy loam |
| 107 | H. J. Davis | Union, Cass county | | May 15, '89 | Oct. 6, '89 | Sandy loam |
| 108 | J. S. Howell | Howells, Colfax county | | May 5, '89 | Oct. 4, '89 | Rich loam |
| 109 | John Fees | Utica, Seward county | | May 3, '89 | Oct. 4, '89 | Black loam |
| 110 | G. H. Stocking | Wahoo, Saunders county | | June 5, '89 | Oct. 8, '89 | Sandy loam |
| 111 | E. S. Blanchard | Beaver Crossing, Seward county | | | Oct. 7, '89 | Black loam |
| 112 | J. Leason & Son | Fairfield, Clay county | | May 3, '89 | Sept. 30, '89 | Upland |
| 113 | S. Weiley | Pilger, Stanton county | | May 15, '89 | Sept. 29, '89 | Prairie loam |
| 114 | C. T. Kenyon | Howard City, Howard county | | May 28, '89 | Oct. 3, '89 | Sandy clay |
| 115 | C. T. Kenyon | Howard City, Howard county | | May 28, '89 | Oct. 3, '89 | Sandy clay |
| 116 | H. B. Good | Tecumseh, Johnson county | | May 15, '89 | Oct. 5, '89 | Sandy loam |
| 117 | A. C. Robbins | Orleans, Harlan county | Vilmorin | May 14, '89 | Oct. 5, '89 | Sandy loam |
| 118 | J. C. Lloyd | Utica, Seward county | | May 5, '89 | Sept. 26, '89 | Black loam |
| 119 | | | | | | |
| 120 | | | | | | |
| 121 | | | | | | |
| 122 | | | | | | |
| 123 | Hugh Robertson | Webster, Dodge county | Vilmorin | May 20, '89 | Oct. 1, '89 | Prairie |
| 124 | L. E. Wales | Edgar, Clay county | | June 1, '89 | Oct. 1, '89 | Prairie |
| 125 | E. D. Chapin | McCook, Red Willow county | White Sugar | May 10, '89 | Oct. 9, '89 | Sandy loam |
| 126 | N. B. Bisbee | Chambers, Holt county | Lane's Imp'l | May 25, '89 | Oct. 10, '89 | Sandy loam |
| 127 | Law'nce Meracle | Republican City, Harlan Co | Vilmorin | June 3, '89 | Oct. 12, '89 | Clay |
| 128 | John Imhoff | Crete, Saline county | Lane's Imp'l | June 3, '89 | Oct. 14, '89 | Sandy loam |
| 129 | Joseph Gass | Pilot, Custer county | Vilmorin | May 24, '89 | Oct. 8, '89 | High land |
| 130 | Henry Nagle | Chicago, Antelope county | Lane's Imp'l | May 13, '89 | Oct. 10, '89 | Sandy loam |
| 131 | W. H. Kelly | Germantown, Seward county | Vilmorin | May 18, '89 | Oct. 11, '89 | Sandy loam |
| 132 | L. A. Ganson | Lodge Pole, Cheyenne county | | May 31, '89 | Oct. 7, '89 | Sandy loam |
| 133 | W. R. Hutchinson | Pawnee, Pawnee county | Vilmorin | May 15, '89 | Oct. 14, '89 | Sandy loam |
| 134 | M. F. Wood | La Platte, Sarpy county | Vilmorin | May 11, '89 | Oct. 12, '89 | Black loam |
| 135 | J. Legget | Platte Center, Platte county | Vilmorin | May 15, '89 | Oct. 14, '89 | Brown loam |
| 136 | B. Thompson | Swanton, Saline county | Lane's Imp'l | May 30, '89. | Oct. 1, '89 | Black loam |
| 137 | Philo Eddy | Inavale, Webster county | Vilmorin | May 6, '89 | Oct. 14, '89 | Black loam |
| 138 | G. W. Clark | Alliance, Box Butte county | Vilmorin | May 16, '89 | Oct. 14, '89 | Black loam |

—CONTINUED.

| *Amount of cultivation.* | SEASON. | | | | | | | | | | | | | | | WT. OF BEET. | | *Total solids.* | PER CENT OF SUGAR. | | *Purity.* | *Serial number.* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *May.* | | | *June.* | | | *July.* | | | *August.* | | | *September.* | | | *Pounds.* | *Ounces.* | | *Sucrose.* | *Glucose.* | | |
| | T. | R. | R. D. | T. | R. | R. D. | T. | R. | R. D. | T. | R. | R. D. | T. | R. | R. D. | | | | | | | |
| | | | | | | | | | | | | | | | | 1 | 7 | 23.7 | 16.90 | 0.102 | 71 | 73 |
| | | | | | | | | | | | | | | | | 1 | 2 | 23.7 | 20.27 | 0.080 | 86 | 74 |
| | | | | | | | | | | | | | | | | 1 | | 23.7 | 19.10 | 0.190 | 80 | 75 |
| | | | | | | | | | | | | | | | | 2 | 5 | 17.0 | 10.52 | 0.105 | 80 | 76 |
| Cultivated 3 times | | | | | | | | | | | | | | | | 2 | 1 | 23.7 | 20.28 | 0.147 | 86 | 77 |
| Cultivated 3 times | | | | | | | | | | | | | | | | 3 | 3 | 23.7 | 20.29 | 0.254 | 86 | 78 |
| Cultivated 3 times | | | | | | | | | | | | | | | | 2 | | 23.7 | 21.41 | 0.138 | 90 | 79 |
| Cultivated 3 times | | | | | | | | | | | | | | | | 2 | 3 | 23.7 | 18.25 | 0.296 | 77 | 80 |
| Hoed twice | 55.8 | 2.71 | 12 | 66.0 | 1.95 | 14 | 72.0 | 6.01 | 10 | 72.0 | 2.06 | 10 | 60.0 | 2.57 | 6 | 7 | | 19.9 | 9.00 | 0.500 | 45 | 81 |
| Hoed twice | 55.8 | 2.71 | 12 | 66.0 | 1.95 | 14 | 72.0 | 6.01 | 10 | 72.0 | 2.06 | 10 | 60.0 | 2.57 | 6 | 3 | 5 | 17.0 | 5.80 | 0.470 | 34+ | 82 |
| Hoed twice | 55.8 | 2.71 | 12 | 66.0 | 1.95 | 14 | 72.0 | 6.01 | 10 | 72.0 | 2.06 | 10 | 60.0 | 2.57 | 6 | 4 | 3 | 16.8 | 7.20 | 0.270 | 43 | 83 |
| Hoed twice | 55.8 | 2.71 | 12 | 66.0 | 1.95 | 14 | 72.0 | 6.01 | 10 | 72.0 | 2.06 | 10 | 60.0 | 2.57 | 6 | 1 | 9 | 10.0 | 9.02 | 0.075 | 90 | 84 |
| Hoed twice | 55.8 | 2.71 | 12 | 66.0 | 1.95 | 14 | 72.0 | 6.01 | 10 | 72.0 | 2.06 | 10 | 60.0 | 2.57 | 6 | 1 | 10 | 14.7 | 13.40 | 0.240 | 91 | 85 |
| Hoed twice | 55.8 | 2.71 | 12 | 66.0 | 1.95 | 14 | 72.0 | 6.01 | 10 | 72.0 | 2.06 | 10 | 60.0 | 2.57 | 6 | 3 | 12 | 10.0 | 9.60 | 0.260 | 96 | 86 |
| Hoed twice | 55.8 | 2.71 | 12 | 66.0 | 1.95 | 14 | 72.0 | 6.01 | 10 | 72.0 | 2.06 | 10 | 60.0 | 2.57 | 6 | 3 | 13 | 17.0 | 6.75 | 0.342 | 39+ | 87 |
| Hoed twice | 55.8 | 2.71 | 12 | 66.0 | 1.95 | 14 | 72.0 | 6.01 | 10 | 72.0 | 2.06 | 10 | 60.0 | 2.57 | 6 | 1 | 10 | 23.7 | 14.04 | 0.113 | 60 | 88 |
| Hoed twice | 55.8 | 2.71 | 12 | 66.0 | 1.95 | 14 | 72.0 | 6.01 | 10 | 72.0 | 2.06 | 10 | 60.0 | 2.57 | 6 | 1 | 8 | 23.7 | 15.77 | 0.113 | 66+ | 89 |
| | | | | | | | | | | | | | | | | 1 | 13 | 26.6 | 13.28 | 0.370 | 61 | 90 |
| Hoed twice | | | | | | | | | | | | | | | | 3 | 3 | 17.0 | 11.49 | 0.010 | 68 | 91 |
| | | | | | | | | | | | | | | | | 1 | 6 | 23.7 | 19.52 | 0.010 | 80 | 92 |
| Hoed twice | | | | | | | | | | | | | | | | 3 | 8 | 19.3 | 9.91 | 0.052 | 51 | 93 |
| | | | | | | | | | | | | | | | | 3 | 5 | 20.4 | 10.14 | 0.009 | 50 | 94 |
| | | | | | | | | | | | | | | | | 2 | 4 | 20.4 | 10.14 | 0.017 | 52 | 95 |
| | | | | | | | | | | | | | | | | | 13 | 23.7 | 13.51 | 0.100 | 58 | 96 |
| | | | | | | | | | | | | | | | | | 14 | 23.7 | 15.32 | 0.230 | 65 | 97 |
| | | | | | | | | | | | | | | | | 1 | 9 | 23.7 | 9.69 | 0.160 | 40 | 98 |
| | | | | | | | | | | | | | | | | | 11 | 23.7 | 20.28 | 0.104 | 86 | 99 |
| | | | | | | | | | | | | | | | | 1 | 8 | 23.7 | 15.09 | 0.009 | 64 | 100 |
| | | | | | | | | | | | | | | | | 2 | | 23.7 | 15.99 | 0.107 | 66 | 101 |
| | | | | | | | | | | | | | | | | | 10 | 23.7 | 19.60 | 0.174 | 83 | 102 |
| | | | | | | | | | | | | | | | | | 13 | 23.7 | 21.18 | 0.087 | 89 | 103 |
| | | | | | | | | | | | | | | | | 1 | | 22.6 | 15.09 | 0.006 | 67 | 104 |
| | | | | | | | | | | | | | | | | | 14 | 23.7 | 22.08 | 0.009 | 93 | 105 |
| | | | | | | | | | | | | | | | | 1 | 8 | 23.7 | 20.28 | 0.076 | 85 | 106 |
| Plowed | 65.0 | 5.12 | 12 | 67.5 | 3.65 | 13 | 73.8 | 5.50 | 7 | 74.9 | 8.11 | 5 | 66.1 | 2.49 | 0 | 3 | 3 | 12.4 | 4.97 | 0.310 | 40+ | 107 |
| | | | | | | | | | | | | | | | | 6 | | 17.0 | 10.36 | 0.131 | 61 | 108 |
| Hoed once | | | | | | | | | | | | | | | | 4 | 4 | 14.7 | 6.53 | 0.342 | 45 | 109 |
| Hoed once | | 2.93 | 9 | | 5.63 | 8 | | 8.94 | 11 | | 8.16 | 9 | | 2.08 | 9 | 2 | 2 | 15.2 | 4.05 | 0.350 | 26 | 110 |
| Hoed once | | | | | | | | | | | | | | | | 2 | 11 | 17.0 | 6.76 | 0.204 | 39 | 111 |
| Weeded | | | | | | | | | | | | | | | | 6 | 9 | 12.4 | 4.27 | 0.833 | 34 | 112 |
| Cultivated | | | | | | | | | | | | | | | | 3 | 4 | 14.7 | 7.88 | 0.625 | 54 | 113 |
| | | | | | | | | | | | | | | | | 2 | 3 | 19.3 | 10.14 | 0.413 | 52 | 114 |
| | | | | | | | | | | | | | | | | | 15 | 21.6 | 12.39 | 0.314 | 57 | 115 |
| Same as corn | | 5.42 | | | 3.65 | | | 5.40 | | | 12.1 | | | 1.50 | | 5 | 3 | 17.0 | 7.88 | 0.100 | 46 | 116 |
| Plowed | | | | | | | | | | | | | | | | 3 | 10 | 14.7 | 6.76 | 0.016 | 45 | 117 |
| | | | | | | | | | | | | | | | | 6 | | 10.1 | 4.95 | 0.100 | 49 | 118 |
| | | | | | | | | | | | | | | | | 3 | 8 | 21.6 | 13.52 | 0.480 | 62 | 119 |
| | | | | | | | | | | | | | | | | | 10 | 21.6 | 14.42 | 0.212 | 67 | 120 |
| | | | | | | | | | | | | | | | | 2 | 8 | 17.0 | 7.66 | 0.440 | 45 | 121 |
| | | | | | | | | | | | | | | | | 1 | 7 | 23.7 | 14.65 | 0.495 | 62 | 122 |
| Hoed several times | 58.7 | 2.41 | 9 | 70.2 | 5.18 | 7 | 73.7 | 10.2 | 9 | 73.2 | 2.12 | 6 | 63.2 | 1.40 | 5 | 3 | | 19.3 | 9.01 | 0.421 | 47 | 123 |
| None | | | | | | | | | | | | | | | | 3 | | 17.0 | 6.54 | 0.180 | 38 | 124 |
| Hoed twice | | | | | | | | | | | | | | | | 4 | 8 | 21.5 | 12.62 | 0.220 | 59 | 125 |
| Hoed twice | | | | | | | | | | | | | | | | 3 | 6 | 19.4 | 11.26 | 0.166 | 58 | 126 |
| Hoed twice | | | | | | | | | | | | | | | | 1 | 9 | 19.3 | 8.54 | 0.328 | 44 | 127 |
| | 61.0 | 4.46 | 14 | 68.8 | 2.78 | 11 | 73.1 | 6.05 | 11 | 72.0 | 5.86 | 6 | 61.3 | 1.97 | 5 | 4 | 4 | 19.3 | 11.25 | 0.166 | 58 | 128 |
| Same as corn | 58.1 | 1.03 | 8 | 71.5 | 4.18 | 7.4 | 75.0 | 4.76 | 7.4 | 74.5 | 1.28 | 6.6 | 59.9 | 1.02 | 2.8 | 2 | 9 | 21.5 | 14.42 | 0.114 | 67 | 129 |
| Cultivated and hoed, | 57.7 | 1.57 | 11 | 68.1 | 4.90 | 10 | 71.5 | 4.03 | 12 | 71.4 | 0.39 | 7 | 57.3 | 1.49 | 7 | 1 | 7 | 23.7 | 22.08 | 0.380 | 93 | 130 |
| Hoed | | | | | | | | | | | | | | | | 2 | 13 | 14.7 | 4.57 | 0.178 | 30 | 131 |
| Hoed | 54.6 | 3.14 | ... | 65.6 | 1.20 | ... | 72.4 | 1.40 | ... | 73.1 | 3.75 | ... | 59.7 | 1.20 | ... | 5 | 5 | 23.7 | 16.22 | 0.227 | 68 | 132 |
| Hoed | | | | | | | | | | | | | | | | 2 | 1 | 17.7 | 7.21 | 0.460 | 41 | 133 |
| Hoed | | | | | | | | | | | | | | | | 2 | 4 | 19.3 | 11.27 | 0.096 | 58 | 134 |
| Hoed | | | | | | | | | | | | | | | | 3 | 13 | 19.0 | 9.24 | 0.054 | 49 | 135 |
| Cultivated | 61.0 | 4.46 | 14 | 68.8 | 2.78 | 11 | 73.1 | 6.05 | 11 | 72.0 | 5.86 | 6 | 61.3 | 1.97 | 5 | 4 | 10 | 19.2 | 9.23 | 0.543 | 48 | 136 |
| Hoed | | | | | | | | | | | | | | | | 12 | 15 | 19.4 | 9.69 | 0.080 | 50 | 137 |
| Hoed | | | | | | | | | | | | | | | | | 15 | 23.7 | 18.94 | 0.099 | 80 | 138 |

TABLE NO. I

| *Serial number.......* | GROWER. | POSTOFFICE ADDRESS | *Variety of beets grown.* | *Time of planting.* | *Time of harvesting.* | *Kind of soil.* |
|---|---|---|---|---|---|---|
| 139 | G. B. Campbell | Pender, Thurston county | Vilmorin | May 29, '89 | Oct. 9, '89 | Black loam |
| 140 | E. E. Adams | Mentorville, Antelope county | Vilmorin | May 15, '89 | Oct. 10, '89 | Sandy loam |
| 141 | N. D. Bear | Orleans, Harlan county | | May 30, '89 | Oct. 18, '89 | Bottom land |
| 142 | Wm. Tweede | Bassett, Keya Paha county | | May 25, '89 | Oct. 3, '89 | Sandy loam |
| 143 | W. O. Coe | Orleans, Harlan county | | May 10, '89 | Oct. 10, '89 | Creek bot'm |
| 144 | R. L. Grosvenor | Hoskins, Wayne county | Vilmorin | May 25, '89 | Sep. 25, '89 | Sandy loam |
| 145 | Jacob Beaver | Leonie, Holt county | | May 15, '89 | Oct. 29, '89 | Sandy loam |
| 146 | Jacob Beaver | Leonie, Holt county | | May 15. '89 | Oct. 29, '89 | Sandy loam |
| 147 | S. R. Smith | Wabash, Cass county | Vilmorin | | Oct. 15, '89 | Black loam |
| 148 | Edward Arnold | Odell, Gage county | | May 15, '89 | Oct. 26, '89 | Sandy loam |
| 149 | J. B. Mowrer | Aurora, Hamilton county | Vilmorin | June 1, '89 | Oct. 30, '89 | Light |
| 150 | John Daw | Scottsville, Holt county | Lane's Imp'l | May 28, '89 | Oct. 15, '89 | Sandy loam |
| 151 | G. W. Alexander | Milligan, Saline county | Vilmorin | June 1, '89 | Oct. 25, '89 | Prairie |
| 152 | G. W. Alexander | Milligan, Saline county | Vilmorin | June 1, '89 | Oct. 25, '89 | Prairie |
| 153 | G. W. Alexander | Milligan, Saline county | Vilmorin | June 1, '89 | Oct. 25, '89 | Prairie |
| 154 | C. D. Emerson | Norman, Kearney county | Lane's Imp'l | May 17, '89 | Oct. 1, '89 | Prairie |
| 155 | C. D. Emerson | Norman, Kearney county | Lane's Imp'l | May 17, '89 | Oct. 1, '89 | Prairie |
| 156 | Joseph Lamb | Hubbell, Thayer county | Vilmorin | May 23, '89 | Nov. 4, '89 | Black loam |
| 157 | H. S. Caswell | Neligh, Antelope county | Vilmorin | June 1, '89 | Oct. 19, '89 | Sandy loam |
| 158 | | Minden, Kearney county | | | | |
| 159 | | Minden, Kearney county | | | | |
| 160 | | Minden, Kearney county | | | | |
| 161 | | Minden, Kearney county | | | | |
| 162 | | Minden, Kearney county | | | | |
| 163 | | | | | | |
| 164 | | | | | | |
| 165 | | | | | | |
| 166 | L. H. Jewett | Broken Bow, Custer county | | | | |

—CONCLUDED.

| *Amount of cultivation.* | SEASON. | | | | | | | | | | | | | | | WEIGHT OF BEET. | | *Total Solids.........* | PER CENT OF SUGAR. | | *Purity.........* | *Serial Number.........* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *May.* | | | *June.* | | | *July.* | | | *August.* | | | *September.* | | | *Pounds......* | *Ounces. ......* | | *Sucrose.......* | *Glucose.......* | | |
| | T. | R. | R. D. | T. | R. | R. D. | T. | R. | R. D. | T. | R. | R. D. | T. | R. | R. D. | | | | | | | |
| Same as corn............ | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 6 | 12 | 23.7 | 7.43 | 0.560 | 32 | 139 |
| Hoed........................ | 57.7 | 1.57 | 11 | 68.1 | 4.9 | 10 | 71.5 | 4.03 | 12 | 71.4 | 0.39 | 7 | 57.3 | 1.49 | 7 | 1 | 2 | 23.7 | 18.48 | 0.035 | 78 | 140 |
| Hoed........................ | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 5 | 4 | 23.7 | 5.91 | 0.520 | 25 | 141 |
| Hoed twice............... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 2 | 3 | 14.7 | 11.26 | 0.312 | 77 | 142 |
| Cultivated................ | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 6 | 15 | 19.3 | 6.30 | 0.145 | 33 | 143 |
| ................................ | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 3 | 2 | 21.5 | 6.44 | 0.590 | 30 | 144 |
| ................................ | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 7 | 23.7 | 13.52 | 0.540 | 57 | 145 |
| ................................ | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 12 | 23.7 | 16.90 | 0.540 | 71 | 146 |
| Hoed........................ | 65.0 | 5.12 | 12 | 67.5 | 3.65 | 13 | 73.8 | 5.50 | 10 | 74.4 | 9.11 | 5 | 61.1 | 2.49 | 0 | 3 | 8 | 19.3 | 6.76 | 0.220 | 35 | 147 |
| ................................ | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 5 | 15 | 14.7 | 2.26 | 0.500 | 17 | 148 |
| Same as corn............ | ...... | ...... | 7 | ...... | ...... | 7 | ...... | ...... | 9 | ...... | ...... | 4 | ...... | ...... | 5 | 3 | 3 | 12.4 | 8.57 | 0.190 | 70 | 149 |
| Hoed........................ | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 3 | 12 | 21.5 | 8.34 | 0.140 | 39 | 150 |
| Hoed........................ | 61.0 | 4.46 | 14 | 68.8 | 2.78 | 7 | 73.1 | 6.05 | 11 | 72.0 | 5.86 | 6 | 61.3 | 1.97 | 5 | 3 | 12 | 20.4 | 8.34 | 0.082 | 41 | 151 |
| Hoed........................ | 61.0 | 4.46 | 14 | 68.8 | 2.78 | 7 | 73.1 | 6.05 | 11 | 72.0 | 5.86 | 6 | 61.3 | 1.97 | 5 | 3 | 13 | 23.7 | 6.76 | 0.160 | 29 | 152 |
| Hoed........................ | 61.0 | 4.46 | 14 | 68.8 | 2.78 | 7 | 73.1 | 6.05 | 11 | 72.0 | 5.86 | 6 | 61.3 | 1.97 | 5 | 3 | 10 | 20.4 | 8.34 | 0.270 | 41 | 153 |
| Hoed........................ | 58.8 | 5.29 | 10 | 71.0 | 5.71 | 14 | 74.8 | 7.15 | 4 | 73.8 | 2.40 | ... | ...... | ...... | 6 | 3 | 10 | 23.7 | 16.81 | 0.220 | 46 | 154 |
| Hoed........................ | 58.8 | 5.29 | 10 | 71.0 | 5.71 | 14 | 74.8 | 7.15 | 4 | 73.8 | 2.40 | ... | ...... | ...... | 6 | 6 | 14 | 21.5 | 9.24 | 0.240 | 43 | 155 |
| Hoed........................ | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 2 | 11 | 14.7 | 8.34 | 0.200 | 56 | 156 |
| Hoed........................ | 57.7 | 1.57 | 11 | 68.1 | 4.9 | 10 | 71.5 | 4.03 | 12 | 71.4 | 0.39 | 7 | 57.3 | 1.49 | 7 | 1 | 10 | 23.7 | 16.90 | 0.190 | 72 | 157 |
| ................................ | 58.8 | 5.24 | 10 | 71.0 | 5.71 | 14 | 74.8 | 7.15 | 4 | 73.8 | 2.4 | ... | ...... | ...... | 6 | 1 | 9 | 12.4 | 3.37 | 0.223 | 27 | 158 |
| ................................ | 58.8 | 5.24 | 10 | 71.0 | 5.71 | 14 | 74.8 | 7.15 | 4 | 73.8 | 2.4 | ... | ...... | ...... | 6 | 3 | 5 | 19.3 | 7.44 | 0.409 | 38+ | 159 |
| ................................ | 58.8 | 5.24 | 10 | 71.0 | 5.71 | 14 | 74.8 | 7.15 | 4 | 73.8 | 2.4 | ... | ...... | ...... | 6 | 1 | 10 | 19.3 | 13.52 | 0.450 | 70 | 160 |
| ................................ | 58.8 | 5.24 | 10 | 71.0 | 5.71 | 14 | 74.8 | 7.15 | 4 | 73.8 | 2.4 | ... | ...... | ...... | 6 | 2 | 13 | 19.3 | 8.78 | 0.105 | 65 | 161 |
| ................................ | 58.8 | 5.24 | 10 | 71.0 | 5.71 | 14 | 74.8 | 7.15 | 4 | 73.8 | 2.4 | ... | ...... | ...... | 6 | 1 | ...... | 23.7 | 15.09 | 0.125 | 64 | 162 |
| ................................ | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 2 | 6 | 19.3 | 14.42 | 0.176 | 94 | 163 |
| ................................ | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 5 | 23.7 | 12.56 | 0.111 | 53 | 164 |
| ................................ | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 4 | 23.7 | 21.86 | 0.10[illegible] | 92 | 165 |
| ................................ | 58.1 | 1.03 | 8 | 71.5 | 4.18 | 7.4 | 75.0 | 4.76 | 7.4 | 74.5 | 1.28 | 6.6 | 59.9 | 1.02 | 2.8 | 2 | 5 | 21.5 | 12.17 | 0.125 | 57 | 166 |

"In this study, therefore, it is desirable that we take into consideration as factors: the average temperature, rainfall, humidity, and number of rainy days for each month during the growing season.

"Upon consulting the map of the European states showing the location of the beet-root culture, we find it generally concentrating toward the north. But in the study of the meterological conditions we find that the quantity of rainfall during the year is greater in the south than in the north; and yet in the former section vegetation seems to suffer more from want of moisture than in the latter. Marie Davy justly explains this by referring it to the evaporation due to a higher temperature, more direct sunlight, and a less number of days upon which rain falls.

"Whether these relations be the sole influence tending to confine the beet culture of France to the limits mentioned above or not, it will be of interest to see what are the conditions most suitable to the culture as determined by observation, and what are the conditions recorded for the sections in which the industry has secured a firm footing and has become a source of profit to those engaged in it.

"But before proceeding to a discussion of the records, we desire to call attention to the notions concerning the conditions found by observation to be most favorable to the crop, both as to the production of quantity and quality.

"In this connection, Briem considers that the temperature of the soil should be at least 50° F. at the time of sowing. A warm month of May favors germination; a dry, hot July makes the roots run to seed; a rainy August gives weight; a dry September increases the sugar; whilst a wet September produces the opposite effect. From May to the middle of June should be warm and tolerably moist, with a day temperature from 60° to 65° F. June and July should be relatively cool and rainy, with a day temperature from 65° to 67° F. August and September should be warm and relatively dry, with an average temperature of 64.5° to 67.5° F. October, cool and fresh, with an average temperature of 47.7° F."

Turning now from the conditions of climate found most favorable by observation and experiment, let us see how the conditions of temperature and rainfall are met by the actual facts there existing. For this purpose a chart* of temperature and rainfall curves, for the summer months, in the beet-growing districts of Europe, is given (p. 331).

Comparing these charts of actual conditions of climate with those conditions found to be the best, by the observations of Briem, we observe a remarkable coincidence.

In order to compare the conditions of climate in Nebraska with those in the sugar-growing districts of Europe, and also with those conditions found most favorable by Briem and others for sugar culture in Europe, we present a tabular statement of all meteorological data for the state which was accessible to us. This table was compiled by us from records kindly furnished by Prof. G. D. Swezey, director of the Nebraska Weather Service, and by Prof. Dewitt B. Brace, of the Meteorological Bureau of the Experiment Station.

Statistics from forty-four stations, representing forty counties in the state, are thus presented, extending over periods of from one to eighteen years.

It is to be deplored that more complete statistics in regard to the meteorological conditions in our state are not to be had, not only for use in this instance, but for the purpose of aiding in the solution of all questions relating to the growth and care of crops.

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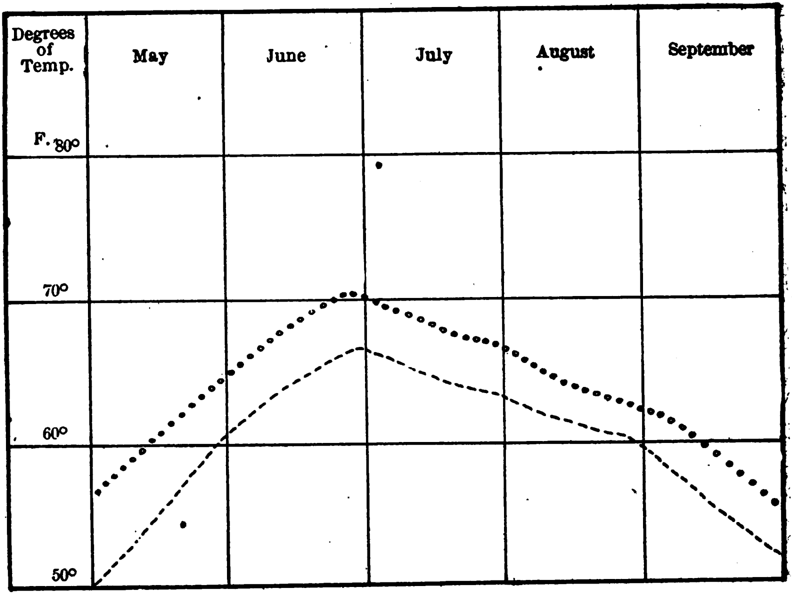
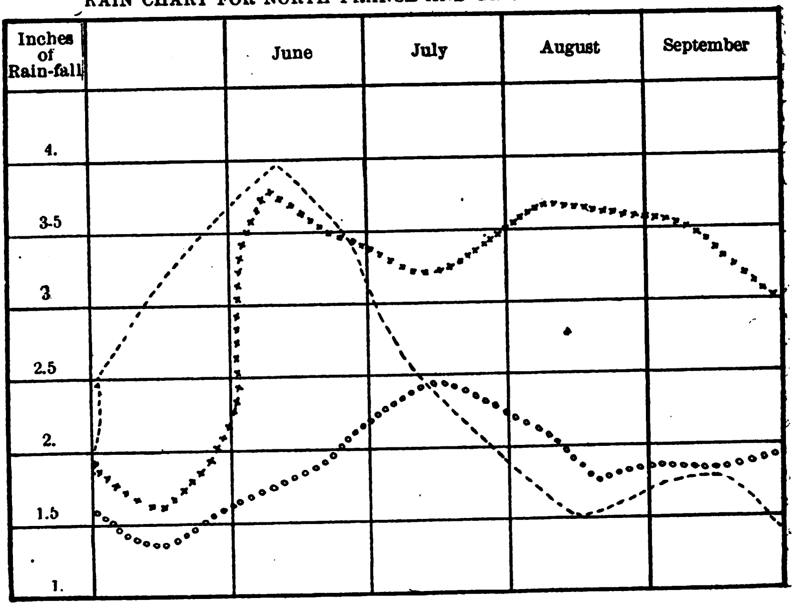
*Special Report Dept. Ag., page 36.

TEMP. CHART FOR NORTH FRANCE AND GERMANY.



TEMP. OF CAMBRAI, FRANCE, o o o o o o.
TEMP. OF HALLE, GERMANY, - - - - - - -.

RAIN CHART FOR NORTH FRANCE AND GERMANY.



RAIN-FALL OF CAMBRAI, FRANCE, o o o o o o
RAIN-FALL OF HALLE, GERMANY, — — — — —.
GENERAL RAIN-FALL OF NORTH FRANCE AND GERMANY, x x x x x x.

TEMPERATURE AND RAINFALL.

| STATIONS. | MAY. | | JUNE. | | JULY. | | AUG. | | SEPT. | | AV. | | TIME. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *R.* | *T.* | *R.* | *T.* | *R.* | *T.* | *R.* | *T.* | *R.* | *T.* | *R.* | *T.* | |
| Ft. McPherson, Lincoln Co | 3.64 | 61.9 | 3.00 | 72.0 | 2.57 | 77.8 | 1.86 | 75.7 | 1.82 | 64.0 | 2.58 | 70.2 | 1868–79 |
| Ft. Kearney, Kearney Co | 2.73 | 58.3 | 2.91 | 70.2 | 4.49 | 75.3 | 2.77 | 72.5 | 2.61 | 62.2 | 3.10 | 67.7 | R 1855–62<br>T 1849–67 |
| Ft. Sidney, Cheyenne Co | 2.51 | 56.1 | 1.61 | 66.3 | 2.15 | 72.8 | 2.13 | 70.4 | 1.31 | 59.0 | 1.94 | 67.0 | 1872–89 |
| Ft. Hartsuff, Valley Co | 3.03 | 60.6 | 3.73 | 67.9 | 4.34 | 72.9 | 1.45 | 73.6 | 2.65 | 63.3 | 3.08 | 67.6 | 1876–80 |
| Ft. Robinson, Dawes Co | 3.15 | 57.6 | 2.03 | 68.3 | 2.11 | 73.1 | 1.95 | 70.0 | 0.54 | 60.2 | 1.95 | 65.8 | 1883–89 |
| Camp Sheridan, Sheridan Co. | 3.35 | 57.0 | 3.49 | 66.3 | 2.97 | 75.8 | 2.11 | 73.1 | 0.90 | 58.4 | 2.56 | 66.1 | 1876–86 |
| Bellevue, Sarpy Co | 3.74 | 55.9 | 3.73 | 71.6 | 3.49 | 76.1 | 2.45 | 73.2 | 3.32 | 64.3 | 3.34 | 68.2 | 1857–74 |
| Clear Creek, Saunders Co | 3.75 | 61.2 | 5.25 | 71.2 | 5.17 | 74.8 | 2.65 | 72.5 | 2 88 | 62.0 | 3.94 | 68.3 | 1874–83 |
| Ft. Niobrara, Cherry Co | 3.94 | 57.2 | 2.85 | 68.9 | 2.31 | 74.4 | 1.41 | 73.3 | 1.40 | 61.2 | 2.38 | 67.0 | 1880–89 |
| Hastings, Adams Co | 3.43 | ...... | ...... | ...... | ...... | ...... | 2.98 | ...... | 1.06 | ...... | 2.72 | ...... | 1883 |
| Oakdale, Antelope Co | 1.38 | 55.0 | 4.38 | 68.5 | 3.54 | 73.9 | 2.68 | 70.2 | .88 | 59.0 | 2.57 | 67.4 | 1888–9 |
| Neligh, Antelope Co | 4.18 | ...... | 2.80 | ...... | 3.02 | ...... | 3.15 | ...... | 2.25 | ...... | 3.46 | ...... | 1883–5 |
| Ravenna, Buffalo Co | 3.89 | ...... | 3.63 | ...... | 5.12 | ...... | 2.90 | ...... | 2.13 | ...... | 3.55 | ...... | 1878–89 |
| Craig, Burt Co | 4.50 | 62.0 | 8.78 | 69.2 | 6.09 | 73.0 | 2.43 | 72.0 | 1.61 | 61.2 | 4.68 | 67.5 | 1889 |
| West Point, Cuming Co | 3.53 | ...... | 4.33 | ...... | 4.20 | ...... | 4.76 | ...... | 2.97 | ...... | 3.95 | ...... | 1884–89 |
| Valentine, Cherry Co | 2.63 | 58.7 | 3.04 | 66.8 | 2.39 | 73.2 | 1.71 | 70.7 | 1.41 | 59.8 | 2.23 | 65.8 | 1887–9 |
| Weeping Water, Cass Co | 4.26 | 59.7 | 3.73 | 68.1 | 4.74 | 74.0 | 4.02 | 71.0 | 3.36 | 64.3 | 4.02 | 67.4 | 1883–9 |
| Sargent, Custer Co | 3.84 | 57.0 | 3.52 | 69.7 | 4.11 | 74.1 | 3.01 | 72.6 | 2.20 | 61.3 | 3.33 | 66.9 | *1884–9 |
| Fremont, Dodge Co | 4.04 | 59.4 | 5.04 | 76.0 | 5.18 | 74.6 | 3.79 | 74.3 | 2.23 | 67.0 | 4.05 | 70.2 | 1880–89 |
| Omaha, Douglas Co | 4.14 | 62.3 | 4.42 | 71.2 | 5.22 | 76.3 | 3.39 | 73.8 | 3.52 | 64.9 | 4.11 | 69.7 | 1876–89 |
| Stockham, Hamilton Co | 4.39 | ...... | 3.61 | ...... | 4.84 | ...... | 5.29 | ...... | 2.34 | ...... | 4.09 | ...... | 1880–86 |
| Marquett, Hamilton Co | 3.82 | ...... | 4.29 | ...... | 4.24 | ...... | 3.26 | ...... | 1.72 | ...... | 3.44 | ...... | 1883–89 |
| Culbertson, Hitchcock Co | ...... | ...... | 2.14 | 70.9 | 6.62 | 79.2 | 2.90 | 76.3 | 0.83 | 57.0 | 3.12 | 70.9 | 1889 |
| Fairbury, Jefferson Co | 4.29 | ...... | 2.85 | ...... | 5.83 | ...... | 2.70 | ...... | 3.02 | ...... | 3.74 | ...... | 1884–89 |
| Minden, Kearney Co | 6.16 | 61.0 | 4.63 | 72.1 | 7.15 | 76.3 | 3.63 | 72.0 | 3.27 | 64.5 | 4.96 | 69.2 | 1884–89 |
| Ogallala, Keith Co | ...... | 59.0 | ...... | 69.8 | ...... | 76.3 | ...... | 72.6 | ...... | 66.1 | ...... | 68.7 | 1885–87 |
| North Platte, Lincoln Co | 3.20 | 58.3 | 3.14 | 68.0 | 3.72 | 75.5 | 2.24 | 73.5 | 1.82 | 60.1 | 2.62 | 67.0 | 1878–89 |
| Palmer, Merrick Co | 3.42 | 57.4 | 3.03 | 69.7 | 4.84 | 76.8 | 2.86 | 70.6 | 2.55 | 63.7 | 3.34 | 67.6 | 1884–89 |
| Genoa, Nance Co | 4.20 | 60.1 | 4.40 | 71.0 | 4.44 | 74.7 | 2.37 | 72.8 | 2.53 | 62.5 | 3.58 | 68.2 | 1881–89 |
| Peru, Nemaha Co | 4.14 | 59.0 | 3.22 | 70.9 | 2.82 | 70.7 | 4.82 | 71.6 | 2.50 | 66.7 | 3.50 | 67.7 | 1871–84 |
| Superior, Nuckolls Co | 4.03 | 59.3 | 3.65 | 72.2 | 5.45 | 75.9 | 3.12 | 72.9 | 2.59 | 67.0 | 3.76 | 69.4 | 1883–85 |
| Nebraska City, Otoe Co | 5.57 | 61.1 | 5.02 | 69.5 | 3.11 | 73.2 | 2.74 | 70.1 | 2.83 | 63.6 | 3.85 | 67.5 | 1883–89 |
| Syracuse, Otoe Co | 4.92 | 64.3 | 5.00 | 70.9 | 4.03 | 78.7 | 3.11 | 73.8 | 2.31 | 66.8 | 3.87 | 70.9 | 1883–89 |
| Pawnee City, Pawnee Co | 3.39 | ...... | 7.33 | ...... | 3.70 | ...... | 2.50 | ...... | 2.21 | ...... | 3.82 | ...... | 1878–84 |
| Table Rock, Pawnee Co | ...... | 60.7 | ...... | 72.5 | ...... | 75.4 | ...... | 75.4 | ...... | 65.2 | ...... | 69.8 | 1881–85 |
| Stromsburg, Polk Co | 3.99 | 62.7 | 4.36 | 72.1 | 3.30 | 79.5 | 3.15 | 72.1 | 2.33 | 62.9 | 3.42 | 69.8 | 1884–87 |
| Red Willow, Red Willow Co | 3.63 | ...... | 3.07 | ...... | 2.95 | ...... | 3.30 | ...... | 1.58 | ...... | 2.90 | ...... | 1882–88 |
| Falls City, Richardson Co | 4.29 | 61.4 | 5.27 | 70.7 | 3.82 | 77.9 | 3.22 | 73.8 | 2.61 | 66.4 | 3.84 | 70.0 | 1884–89 |
| Crete, Saline Co | 4.33 | 60.7 | 3.74 | 70.9 | 3.98 | 75.6 | 3.63 | 73.2 | 1.95 | 65.4 | 3.52 | 69.1 | 1881–89 |
| Ashland, Saunders Co | 4.39 | ...... | 4.67 | ...... | 5.77 | ...... | 5.37 | ...... | 2.92 | ...... | 4.62 | ...... | 1884–89 |
| Hay Springs, Sheridan Co | 4.64 | 54.2 | 3.33 | 65.3 | 2.38 | 71.7 | 3.09 | 67.2 | 0.45 | 55.5 | 2.77 | 62.7 | 1886–89 |
| North Loup, Valley Co | 0.98 | 55.1 | 3.22 | 69.6 | 10.37 | 73.8 | 1.58 | 69.8 | 1.60 | 58.2 | 3.91 | 65.3 | 1888–89 |
| De Soto, Washington Co | 4.41 | 56.3 | 5.19 | 71.3 | 4.17 | 75.2 | 3.67 | 72.8 | 2.86 | 63.5 | 4.06 | 67.8 | 1878–89 |
| Purdum, Blaine Co | 1.83 | 66.1 | ...... | ...... | 1.86 | 72.9 | 4.24 | 68.8 | 2.37 | ...... | 2.57 | 67.2 | 1886–7 |
| Average | 3.74 | 58.9 | 3.93 | 69.8 | 4.2 | 75. | 3.0 | 72.3 | 2.14 | 62.3 | 3.31 | 69.5 | 5 |

A comparison of these results with those of the sugar-growing districts of Europe, and with those climatic conditions apparently required for successful sugar production, shows a close correspondence. In the sugar-producing districts of Europe, the average monthly temperature, for the months of May, June, July, August, September, does not rise above 70° F., nor fall below 50° F., whilst the average monthly rainfall for the same period of time does not fall below 1.5 inches, nor rise above 4 inches. The conditions required for successful culture, in Europe, as given by Briem,† "are, in general, comparatively dry and warm spring months during the time for preparation of soil, planting, and cultivating the crop; moderate temperature, abundant and frequent rains during the summer, the time for the ultimate development of the crop and its valuable constituents; cool and dry fall the time for ripening, harvesting, and storing the crop."

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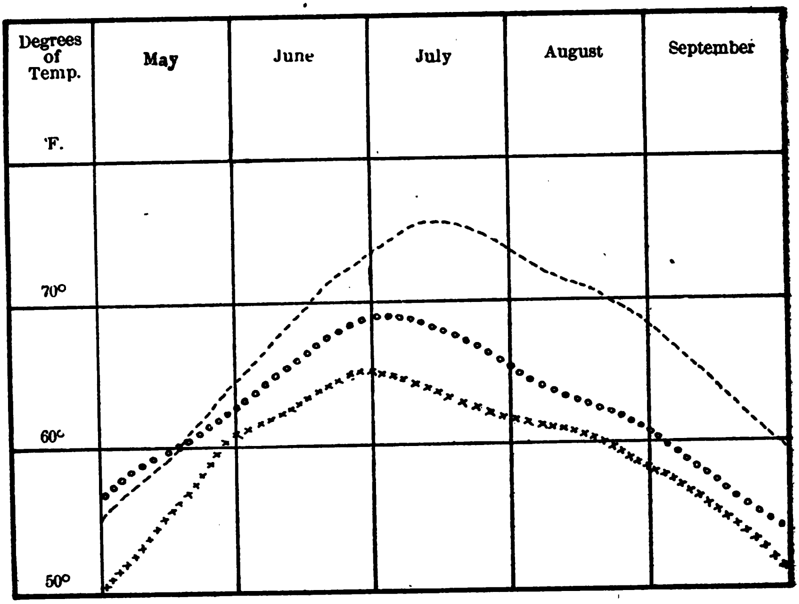
*Except in 1886.

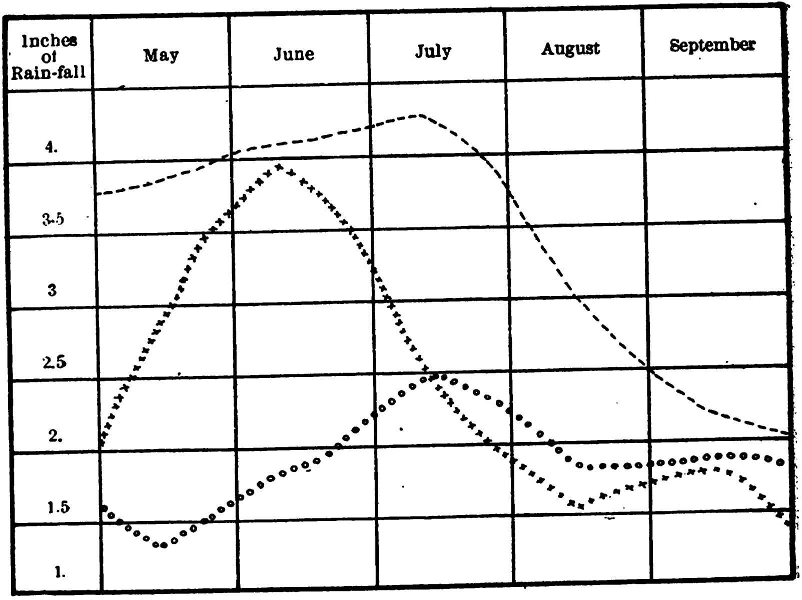
† Special Report Dept. Ag., No. 28, page 70.

TEMPERATURE CHART FOR NEBRASKA.



NEBRASKA, - - - - - - - - - -.
CAMBRAI, FRANCE, o o o o o.
HALLE, GERMANY, x x x x x.

RAIN CHART FOR NEBRASKA.



NEBRASKA, - - - - - - - - - - - -.
CAMBRAI, FRANCE, o o o o o o o o
HALLE, GERMANY, x x x x x x x x x

The average monthly temperature of Nebraska for the months of May, June, July, August, and September ranges between 58.9° F. in May to 75° F. in July, falling to 62.3° in September, with an average of 69.5° F. for the five months, a slight increase of temperature over that prevailing in Europe.

The average monthly rainfall in Nebraska, for the same months, ranges from 3.74 inches in May to 4.2 inches in July, falling to 2.14 inches in September, with a summer average of 3.31 inches. It will be noticed that the rainfall and temperature for corresponding periods of time is slightly higher in Nebraska than in the sugar beet districts of Europe.

Appended is a chart of the temperature and rainfall in Nebraska, on which is placed, for comparison, the curves of temperature and rainfall of the sugar producing districts in Europe.

These curves show plainly that our temperature and rainfall are both somewhat higher than in Europe; they also show that these two factors are more closely correlated, increasing and decreasing together more evenly. It is possible that in this correlation, within certain limits, we may find a more important factor in the solution of the sugar problem in this state than is found in the limited range of temperature and rainfall in Europe. Only continued experiment and observation can determine this point.

Another important point remains to be spoken of: that is, the distribution of this rainfall through the months in question. This distribution is indicated by the following table of the number of rainy days in each of the months at the various stations, as reported by the observers of the Nebraska weather service:

TABULAR STATEMENT OF THE NUMBER OF RAINY DAYS.

| STATIONS. | *May.* | *June.* | *July.* | *Aug.* | *Sept.* | *Years Ob.* |
|---|---|---|---|---|---|---|
| Oakdale, Antelope county | 11.0 | 11.0 | 8.5 | 10.0 | 5.0 | 1888–9 |
| Ravenna, Buffalo county | 9.6 | 8.1 | 9.2 | 6.9 | 5.4 | 1878–89 |
| Craig, Burt county | 9.0 | 10.0 | 10.0 | 6.0 | 7.0 | 1889 |
| Weeping Water, Cass county | 9.6 | 9.0 | 7.3 | 6.3 | 6.3 | 1878–89 |
| Valentine, Cherry county | 13.0 | 11.0 | 9.7 | 7.3 | 6.7 | 1886–89 |
| West Point, Cuming county | 9.2 | 6.6 | 8.3 | 6.7 | 7.6 | 1884–89 |
| Sargent, Custer county | 8.0 | 7.4 | 7.4 | 6.6 | 2.8 | 1883–89 |
| Fremont, Dodge county | 11.5 | 10.8 | 9.3 | 8.9 | 7.4 | 1878–89 |
| Omaha, Douglas county | 13.0 | 11.6 | 9.9 | 8.7 | 8.6 | 1878–89 |
| Marquett, Hamilton county | 9.6 | 9.2 | 8.8 | 8.3 | 5.3 | 1884–89 |
| Culbertson, Hitchcock county | ........ | 10.0 | 8.0 | 8.5 | 3.0 | 1888–89 |
| Stockham, Hamilton county | 9.2 | 8.6 | 10.1 | 8.8 | 6.8 | 1880–86 |
| Fairbury, Jefferson county | 7.7 | 7.4 | 10.8 | 8.2 | 6.5 | 1884–89 |
| Minden, Kearney county | 9.6 | 9.5 | 9.9 | 8.3 | 6.2 | 1878–89 |
| North Platte, Lincoln county | 12.1 | 10.7 | 9.2 | 9.6 | 4.8 | 1878–89 |
| West Hill, Nance county | 8.9 | 9.9 | 9.5 | 8.5 | 6.4 | 1879–89 |
| Peru, Nemaha county | 6.3 | 10.0 | 4.8 | 4.0 | 5.5 | 1879–84 |
| Superior, Nuckolls county | 7.6 | 6.6 | 7.0 | 6.7 | 3.2 | 1879–85 |
| Nebraska City, Otoe county | 9.7 | 9.0 | 9.5 | 9.7 | 5.8 | 1883–89 |
| Syracuse, Otoe county | 9.1 | 8.8 | 7.1 | 7.3 | 5.8 | 1883–89 |
| Pawnee City, Pawnee county | 5.7 | 7.2 | 6.6 | 3.8 | 5.5 | 1878–83 |
| Table Rock, Pawnee county | 8.5 | 7.5 | 8.0 | 4.5 | 5.0 | 1881–84 |
| Stromsburg, Polk county | 10.0 | 8.0 | 8.2 | 9.2 | 8.3 | 1884–87 |
| Red Willow, Red Willow county | 11.0 | 7.2 | 6.8 | 7.2 | 4.7 | 1882–89 |
| Falls City, Richardson county | 7.8 | 9.3 | 6.8 | 7.2 | 7.0 | 1884–89 |
| Crete, Saline county | 9.2 | 8.8 | 8.2 | 5.8 | 6.0 | 1880–89 |
| DeWitt, Saline county | 5.8 | 7.2 | 7.3 | 6.0 | 7.6 | 1879–87 |
| Ashland, Saunders county | 8.7 | 8.8 | 8.3 | 6.4 | 6.7 | 1884–89 |
| Hay Springs, Sheridan county | 1.2 | 7.5 | 6.2 | 8.5 | 2.5 | 1886–89 |
| De Soto, Washington county | 11.8 | 10.4 | 9.4 | 8.7 | 8.7 | 1878–89 |
| York, York county | 7.5 | 7.0 | 8.5 | ........ | 7.0 | 1884–86 |
| Inavale, Webster county | 7.6 | 7.3 | 7.3 | 4.2 | 5.0 | 1878–84 |
| Cedar Bend, Gage county | 6.8 | 9.8 | 7.2 | 5.8 | 3.7 | 1878–83 |
| Average | 8.9 | 8.8 | 8.2 | 7.1 | 5.8 | |

NUMBER OF RAINY DAYS FOR DIFFERENT MONTHS, (BELGIUM.)

| PLACES. | *May.* | *June.* | *July.* | *Aug.* | *Sept.* |
|---|---|---|---|---|---|
| Bruxelles | 14.9 | 15.6 | 16.2 | 15.3 | 14.7 |
| Gand | 15.7 | 15.4 | 17.0 | 15.6 | 14.9 |
| Alost | 13.8 | 15.0 | 16.2 | 10.4 | 15.8 |
| Louvain | 16.4 | 16.7 | 18.1 | 17.9 | 13.7 |
| St. Trond | 12.5 | 15.2 | 12.5 | 15.7 | 13.3 |
| Namur | 14.9 | 16.1 | 14.4 | 14.0 | 14.9 |
| Liege | 17.1 | 15.7 | 15.8 | 16.2 | 15.2 |
| Stavelot | 15.9 | 15.5 | 15.6 | 14.9 | 13.7 |

To permit comparisons, we give a tabular statement of the number of rainy days in each of the summer months in the beet-sugar district of Belgium as compiled by Prof. McMurtrie.

Stated briefly, our rainfall is greater than it is in the sugar districts of Europe and falls in fewer days; our temperature is slightly higher, but is closely correlated to the rainfall; both rainfall and temperature decrease in September, a condition that in itself is conducive to the formation of sugar in the beet. The number of sunny days is about one-third greater here than there. How these modifications of essential conditions will affect the sugar content of beets must be determined by continued experiment in various parts of the state in the raising of beets from good seed and under the best conditions of culture.

## SUGAR CONTENT.

Probably the most important factor, in the estimation of one who is looking forward to the raising of sugar beets as a possible business, is the amount of sugar found in the beets raised in Nebraska during this year.

An examination of the column headed sucrose (Table I) shows that the sugar content varies, to a marked extent, from 2 to 22.28 per cent. It is also apparent that neither the low nor the high sugar percentages are confined to beets from any one locality. To illustrate this point more clearly a map of the state is inserted. On this map the places from which beets have been received are indicated by circles.

A close examination of the afore-mentioned table will enable us to separate the results into two classes; the first including all those beets whose sugar content falls below 12 per cent; the second, all those in which the percentage of sugar is more than 12 per cent. Table II shows this more plainly, as it contains only those results ranging above 12 per cent.

Out of the 166 samples of beets analyzed there are 61 in which the sugar content is 12 per cent and over. As has already been intimated, the beets that are rich in sugar, do not represent any one particularly favored locality, but may be looked upon as fairly representing the entire state, as far as differences in soil and in climatic conditions are concerned. On the map the localities from which these richer beets have been received are marked by double circles.

The results in Table I represent about forty counties. Table II represents twenty counties. Owing to the meager data sent with many of the beets, all of the points from which superior beets were received are not indicated on the map.

In raising beets for sugar, it is certainly most important to obtain, as nearly as possible, uniformity in the sugar content. That is, to produce beets whose minimum limit of variation does not fall below 12 per cent.

TABLE

| *Serial number* | GROWER. | POSTOFFICE ADDRESS. | *Variety of beets grown.* | *Time of planting.* | *Time of harvesting.* | *Kind of soil.* |
|---|---|---|---|---|---|---|
| 47 | R. W. Furnas | Brownville, Nemaha county | Vilmorin | May —, '89 | Nov. 8, '89 | Black loam |
| 48 | R. W. Furnas | Brownville, Nemaha county | Vilmorin | May —, '89 | Nov. 8, '89 | Black loam |
| 49 | R. W. Furnas | Brownville, Nemaha county | Vilmorin | May —, '89 | Nov. 8, '89 | Black loam |
| 50 | R. W. Furnas | Brownville, Nemaha county | Vilmorin | May —, '89 | Nov. 8, '89 | Black loam |
| 51 | R. W. Furnas | Brownville, Nemaha county | Vilmorin | May —, '89 | Nov. 8, '89 | Black loam |
| 52 | Charles Redfield | Max, Dundy county | Vilmorin | May 3, '89 | Oct. 16, '89 | Rich loam |
| 53 | Charles Redfield | Max, Dundy county | Vilmorin | May 3, '89 | Oct. 16, '89 | Rich loam |
| 54 | Charles Redfield | Max, Dundy county | Vilmorin | May 3, '89 | Oct. 16, '89 | Rich loam |
| 55 | Charles Redfield | Max, Dundy county | Vilmorin | May 3, '89 | Oct. 16, '89 | Rich loam |
| 57 | Col. A. V. Kautz | Fort Niobrara, Cherry county |  | May 20, '89 | Oct. 3, '89 | Loam |
| 58 | Col. A. V. Kautz | Fort Niobrara, Cherry county |  | May 20, '89 | Oct. 3, '89 | Loam |
| 59 | Col. A. V. Kautz | Fort Niobrara, Cherry county |  | May 20, '89 | Oct. 3, '89 | Loam |
| 65 | W. H. Reynolds | Chadron, Dawes county |  | May 20, '89 | Sept. 15, '89 | Sandy loam |
| 67 | W. H. Reynolds | Chadron, Dawes county |  | May 20, '89 | Sept. 15, '89 | Sandy loam |
| 68 | W. H. Reynolds | Chadron, Dawes county |  | May 20, '89 | Sept. 15, '89 | Sandy loam |
| 69 | Daniel Hubbard | Valentine, Cherry county | Vilmorin | May 15, '89 | Oct. 19, '89 | Sandy loam |
| 70 | Daniel Hubbard | Valentine, Cherry county | Vilmorin | May 15, '89 | Oct. 19, '89 | Sandy loam |
| 71 | Daniel Hubbard | Valentine, Cherry county | Vilmorin | May 15, '89 | Oct. 19, '89 | Sandy loam |
| 72 | A. B. Perkins | Grand Island, Hall county |  |  |  |  |
| 73 | A. B. Perkins | Grand Island, Hall county |  |  |  |  |
| 74 | A. B. Perkins | Grand Island, Hall county |  |  |  |  |
| 75 | A. B. Perkins | Grand Island, Hall county |  |  |  |  |
| 76 | A. B. Perkins | Grand Island, Hall county |  |  |  |  |
| 77 | H. T. J. Fuehrman | Grand Island, Hall county | Imperial | May 10, '89 | Sept. 25, '89 | Sandy loam |
| 78 | H. T. J. Fuehrman | Grand Island, Hall county | Am. Vilmorin, | May 10, '89 | Sept. 25, '89 | Sandy loam |
| 79 | H. T. J. Fuehrman | Grand Island, Hall county | Ger. Vilmorin, | June 15, '89, | Oct. 20, '89 | Sandy loam |
| 80 | H. T. J. Fuehrman | Grand Island, Hall county | Wanzleben | June 15, '89 | Oct. 20, '89 | Sandy loam |
| 85 | Rev. Hawkins | Wellfleet, Lincoln county | Vilmorin | May 15, '89 | Oct. 15, '89 | Sandy loam |
| 88 | Rev. Hawkins | Wellfleet, Lincoln county | Vilmorin | May 15, '89 | Oct. 15, '89 | Sandy loam |
| 89 | Rev. Hawkins | Wellfleet, Lincoln county | Vilmorin | May 15, '89 | Oct. 15, '89 | Sandy loam |
| 90 | C. B. Kemple | Hastings, Adams county | Vilmorin | May 1, '89 |  | Sandy loam |
| 92 | S. M. Bates | Hastings, Adams county |  | Apr. 23, '89 | Oct. 17, '89 | Sandy loam |
| 96 | F. Bates | Hastings, Adams county | Vilmorin | May 1, '89 |  |  |
| 97 | Mr. Rinker | Hastings, Adams county | Lane's Imp'l | May 10, '89 | Oct. 25, '89 | Sandy loam |
| 99 | W. W. Philleo | Ayr, Adams county | Vilmorin | June 1, '89 |  | Sandy loam |
| 100 | W. W. Philleo | Ayr, Adams county | Vilmorin | June 1, '89 |  | Sandy loam |
| 101 | W. W. Philleo | Ayr, Adams county | Vilmorin | June 1, '89 |  | Sandy loam |
| 102 | W. W. Philleo | Ayr, Adams county | Vilmorin | June 1, '89 |  | Sandy loam |
| 103 | W. W. Philleo | Ayr, Adams county | Lane's Imp'l | June 1, '89 |  | Sandy loam |
| 104 | W. W. Philleo | Ayr, Adams county | Lane's Imp'l | June 1, '89 |  | Sandy loam |
| 105 | W. W. Philleo | Ayr, Adams county | Lane's Imp'l | June 1, '89 |  | Sandy loam |
| 106 | W. W. Philleo | Ayr, Adams county | Lane's Imp'l | June 1, '89 |  | Sandy loam |
| 115 | C. T. Kenyon | Howard City, Howard county |  | May 28, '89 | Oct. 3, '89 | Sandy clay |
| 119 |  |  |  |  |  |  |
| 120 |  |  |  |  |  |  |
| 122 |  |  |  |  |  |  |
| 125 | E. D. Chapin | McCook, Red Willow county | White Sugar | May 10, '89 | Oct. 9, '89 | Sandy loam |
| 129 | Joseph Gass | Pilot, Custer county | Vilmorin | May 24, '89 | Oct. 8, 89 | High land |
| 130 | Henry Nagle | Chicago, Antelope county | Lane's Imp'l | May 13, '89 | Oct. 10, '89 | Sandy loam |
| 132 | L. A. Ganson | Lodge Pole, Cheyenne county |  | May 31, '89 | Oct. 7, '89 | Sandy loam |
| 138 | G. W. Clark | Alliance, Box Butte county | Vilmorin | May 16, '89 | Oct. 14, '89 | Black loam |
| 140 | E. E. Adams | Mentorville, Antelope county | Vilmorin | May 15 '89 | Oct. 10, '89 | Sandy loam |
| 145 | Jacob Beaver | Leonie, Holt county | Vilmorin | May 15, '89 | Oct. 29, '89 | Sandy loam |
| 146 | Jacob Beaver | Leonie, Holt county | Vilmorin | May 15, '89 | Oct. 29, '89 | Sandy loam |
| 157 | H. S. Caswell | Neligh, Antelope county | Vilmorin | June 1, '89 | Oct. 19, '89 | Sandy loam |
| 160 |  | Minden, Kearney county |  |  |  |  |
| 162 |  | Minden, Kearney county |  |  |  |  |
| 163 |  |  |  |  |  |  |
| 164 |  |  |  |  |  |  |
| 165 |  |  |  |  |  |  |
| 166 | L. H. Jewett | Broken Bow, Custer county |  |  |  |  |

**NO. II.**

| Amount of cultivation. | Season. | | | | | | | | | | | | | | | Wt. of beet. | | Total solids | Per cent of sugar. | | Purity | Serial number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | May. | | | June. | | | July. | | | August. | | | September. | | | Pounds | Ounces | | Sucrose | Glucose | | |
| | T. | R. | R. D. | T. | R. | R. D. | T. | R. | R. D. | T. | R. | R. D. | T. | R. | R. D. | | | | | | | |
| Cultivated twice. | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 3 | 21.5 | 13.97 | 0.011 | 65 | 47 |
| Cultivated twice. | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 2 | 9 | 23.7 | 15.55 | 0.100 | 65 | 48 |
| Cultivated twice. | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 4 | ...... | 23.7 | 15.77 | 0.803 | 67 | 49 |
| Cultivated twice. | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 2 | 7 | 23.7 | 17.17 | 0.180 | 72 | 50 |
| Cultivated twice. | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 2 | 4 | 23.7 | 20.28 | 0.158 | 86 | 51 |
| Cultivated and hoed. | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 2 | ...... | 21.5 | 15.77 | 0.200 | 73 | 52 |
| Cultivated and hoed, | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 6 | 23.6 | 14.19 | 0.140 | 60 | 53 |
| Cultivated and hoed, | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 9 | 23.7 | 17.57 | 0.109 | 75 | 54 |
| Cultivated and hoed, | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 2 | 2 | 23.7 | 16.22 | 0.012 | 69 | 55 |
| Hoed. | 54.0 | 2.45 | 12 | 66.0 | 2.99 | 10 | 71.6 | 2.60 | 8 | 73.0 | 0.34 | 6 | 58.4 | 1.71 | 11 | 1 | 10 | 23.7 | 14.65 | 0.370 | 62 | 57 |
| Hoed. | 54.0 | 2.45 | 12 | 66.0 | 2.99 | 10 | 71.6 | 2.60 | 8 | 73.0 | 0.34 | 6 | 58.4 | 1.71 | 11 | 1 | ...... | 23.7 | 20.28 | 0.025 | 86 | 58 |
| Hoed. | 54.0 | 2.45 | 12 | 66.0 | 2.99 | 10 | 71.6 | 2.60 | 8 | 73.0 | 0.34 | 6 | 58.4 | 1.71 | 11 | 1 | 7 | 23.7 | 16.00 | 0.180 | 70 | 59 |
| Weeded. | 53.4 | 2.55 | ... | 64.6 | 2.71 | ... | 70.5 | 2.67 | ... | 70.8 | 2.15 | ... | 58.3 | 0.38 | ... | 1 | 14 | 23.7 | 16.30 | 0.163 | 70 | 65 |
| Weeded. | 53.4 | 2.55 | ... | 64.6 | 2.71 | ... | 70.5 | 2.67 | ... | 70.8 | 2.15 | ... | 58.3 | 0.38 | ... | 2 | 15 | 19.3 | 16.30 | 0.872 | 84 | 67 |
| Weeded. | 53.4 | 2.55 | ... | 64.6 | 2.71 | ... | 70.5 | 2.67 | ... | 70.8 | 2.15 | ... | 58.3 | 0.3- | ... | 1 | 11 | 18.1 | 12.16 | 0.154 | 70 | 68 |
| Cultivated. | 57.6 | 2.92 | 12 | 64.8 | 2.92 | 10 | 71.2 | 3.27 | 8 | 75.6 | 0.41 | 6 | 58.0 | 1.39 | 11 | 4 | 4 | 23.7 | 15.90 | 0.176 | 63 | 69 |
| Cultivated. | 57.6 | 2.92 | 12 | 64.8 | 2.92 | 10 | 71.2 | 3.27 | 8 | 75.6 | 0.41 | 6 | 58.0 | 1.39 | 11 | 4 | 8 | 23.7 | 12.62 | 0.098 | 53 | 70 |
| Cultivated. | 57.6 | 2.92 | 12 | 64.8 | 2.92 | 10 | 71.2 | 3.27 | 8 | 75.6 | 0.41 | 6 | 58.0 | 1.39 | 11 | 2 | 15 | 23.7 | 12.65 | 0.143 | 54 | 71 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | ...... | 23.7 | 14.14 | 0.101 | 59 | 72 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 7 | 23.7 | 16.90 | 0.102 | 71 | 73 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 2 | 23.7 | 20.27 | 0.080 | 86 | 74 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 1 | 23.7 | 19.10 | 0.190 | 80 | 75 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 2 | 5 | 17.0 | 13.52 | 0.105 | 80 | 76 |
| Cultivated 3 times. | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 2 | 1 | 23.7 | 20.28 | 0.147 | 86 | 77 |
| Cultivated 3 times. | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 3 | 3 | 23.7 | 20.29 | 0.284 | 86 | 78 |
| Cultivated 3 times. | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 2 | ...... | 23.7 | 21.41 | 0.138 | 90 | 79 |
| Cultivated 3 times. | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 2 | 3 | 23.7 | 18.25 | 0.296 | 77 | 80 |
| Hoed twice | 55.8 | 2.71 | 12 | 66.0 | 1.95 | 14 | 72.0 | 6.01 | 10 | 72.0 | 2.06 | 10 | 60.0 | 2.57 | 6 | 1 | 2 | 14.7 | 13.40 | 0.240 | 91 | 85 |
| Hoed twice | 55.8 | 2.71 | 12 | 66.0 | 1.95 | 14 | 72.0 | 6.01 | 10 | 72.0 | 2.06 | 10 | 60.0 | 2.57 | 6 | 1 | 10 | 23.7 | 14.04 | 0.113 | 60 | 88 |
| Hoed twice | 55.8 | 2.71 | 12 | 66.0 | 1.95 | 14 | 72.0 | 6.01 | 10 | 72.0 | 2.06 | 10 | 60.0 | 2.57 | 6 | 1 | 8 | 23.7 | 15.77 | 0.113 | 66 | 89 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 13 | 21.6 | 13.28 | 0.370 | 61 | 90 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 6 | 23.7 | 19.52 | 0.010 | 80 | 92 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | 13 | 23.7 | 13.51 | 0.100 | 58 | 96 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | 14 | 23.7 | 15.32 | 0.230 | 65 | 97 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | 11 | 23.7 | 20.28 | 0.104 | 86 | 99 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 8 | 23.7 | 15.09 | 0.009 | 64 | 100 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 2 | ...... | 23.7 | 15.99 | 0.107 | 66 | 101 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | 10 | 23.7 | 19.60 | 0.174 | 83 | 102 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | 13 | 23.7 | 21.18 | 0.087 | 89 | 103 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | ...... | 22.6 | 15.09 | 0.006 | 67 | 104 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | 14 | 23.7 | 22.08 | 0.009 | 93 | 105 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 8 | 23.7 | 20.28 | 0.076 | 85 | 106 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | 15 | 21.6 | 12.39 | 0.314 | 57 | 115 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 3 | 8 | 21.6 | 13.52 | 0.480 | 62 | 119 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | 10 | 21.5 | 14.42 | 0.212 | 67 | 120 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 7 | 23.7 | 14.65 | 0.495 | 62 | 122 |
| Hoed twice | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 4 | 8 | 21.5 | 12.62 | 0.220 | 59 | 125 |
| Same as corn | 58.1 | 1.03 | 8 | 71.5 | 4.18 | 7.4 | 75.0 | 4.76 | 7.4 | 74.5 | 1.28 | 6.6 | 59.9 | 1.02 | 2.8 | 2 | 9 | 21.5 | 14.42 | 0.114 | 67 | 129 |
| Cultivated | 57.7 | 1.57 | 11 | 68.1 | 4.90 | 10 | 71.5 | 4.03 | 12 | 71.4 | 0.59 | 7 | 57.3 | 1.49 | 7 | 1 | 7 | 23.7 | 22.08 | 0.380 | 93 | 130 |
| Hoed. | 54.6 | 3.14 | ... | 65.6 | 1.20 | ... | 72.4 | 1.40 | ... | 73.1 | 3.75 | ... | 59.7 | 1.20 | ... | 5 | 5 | 23.7 | 16.22 | 0.227 | 68 | 132 |
| Hoed. | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | 15 | 23.7 | 18.94 | 0.099 | 80 | 138 |
| Hoed. | 57.7 | 1.57 | 11 | 68.1 | 4.90 | 10 | 71.5 | 4.03 | 12 | 71.4 | 0.39 | 7 | 57.3 | 1.49 | 7 | 1 | 2 | 23.7 | 18.48 | 0.035 | 78 | 140 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 7 | 23.7 | 13.52 | 0.540 | 57 | 145 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 12 | 23.7 | 16.90 | 0.540 | 71 | 146 |
| Hoed | 57.7 | 1.57 | 11 | 68.1 | 4.90 | 10 | 71.5 | 4.03 | 12 | 71.4 | 0.39 | 7 | 57.3 | 1.49 | 7 | 1 | 10 | 23.7 | 16.90 | 0.190 | 72 | 157 |
| ...... | 58.8 | 5.24 | 10 | 70.1 | 5.71 | 14 | 74.8 | 13.2 | 4 | 73.8 | 2.40 | ... | ...... | ...... | 6 | 1 | 10 | 19.3 | 13.52 | 0.450 | 70 | 160 |
| ...... | 58.8 | 5.24 | 10 | 70.1 | 5.71 | 14 | 74.8 | 13.2 | 4 | 73.8 | 2.40 | ... | ...... | ...... | 6 | 1 | ...... | 23.7 | 15.09 | 0.125 | 64 | 162 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 2 | 6 | 19.3 | 14.42 | 0.176 | 94 | 163 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 5 | 23.7 | 12.56 | 0.111 | 53 | 164 |
| ...... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | ...... | ...... | ... | 1 | 4 | 23.7 | 21.86 | 0.109 | 92 | 165 |
| ...... | 58.1 | 1.03 | 8 | 71.5 | 4.18 | 7.4 | 75.0 | 4.76 | 7.4 | 74.5 | 1.28 | 6.6 | 59.9 | 1.02 | 2.8 | 2 | 5 | 21.5 | 12.17 | 0.125 | 57 | 166 |

Before discussing the wide range of variation in the sugar percentages of this season's beets, it is necessary to compare those conditions deemed essential to a good and uniform sugar content, in those countries where the sugar-beet industry is most highly developed, with the conditions under which our first beets were grown.

In France and Germany, growers use seed produced from beets known to be rich in sugar. Further, the seed must be grown in the locality where it is to be planted, that it may be adapted to the soil and climate. The time of planting is of great importance. An early date—determined by the temperature of the soil—is necessary to a long growing season. After planting, the soil and the young plant receive assiduous attention, the soil is kept free from weeds, and is hoed and cultivated frequently, in order to admit air, and prevent the too rapid evaporation of moisture. The young plants are carefully thinned until the spaces between them bear a certain ratio to the size of the beet wanted, the richness of the soil, etc. The greatest care and skill are exercised, from the selection of the seed to the harvesting of the beet, that the crop may be rich in sugar and uniform in quality.

In contrast to this careful weighing of conditions, and skillful use of opportunities, our farmers planted any seed that could be obtained, not necessarily poor seed, but seed, in nearly every case, not yet acclimated here, nor adapted to our soil. This seed was planted, in some cases, as early as April 4, and in other cases as late as June 15. As a rule, our farmers were entirely unacquainted with the best methods of cultivating beets for sugar. An exception to this general condition must be made in the case of the farmers about Grand Island. The effect of their experience and knowledge is seen in the uniformly high sugar percentages in beets numbered 73, 74, 75, 76, 77, 78, 79, and 80, in Table II.

Not only were the mass of the farmers unacquainted with the best methods of raising beets for sugar, but in many cases ordinary cultivation was but sparingly given, judging from the reports sent with beets, and now on file. It is perfectly safe to say that in no cases were the roots given the thorough and elaborate cultivation of the European farmer.

The consideration of these two classes of conditions, the one dictated by experience and in use in countries old in the business of raising beets for sugar; the other, compelled by circumstances, in a new country, taking its first steps in a new industry, with everything to learn, gives us, at least, an indication of the cause of the great differences of sugar content in the beets grown this year.

Again, this fact that good and poor beets come alike from all parts of the state, as is seen by consulting the map, shows that the reason for the difference is not so much in our soil and climate as in the minor conditions of seed and cultivation. In this connection it is well to look over Table II and see what conditions accompany richness of sugar in our beets. We find, first, that practically only two varieties, *i. e.*, Lane's Imperial and Vilmorin, appear in this table; that the greater number of the beets are of the latter variety. Again, with richness in sugar we find small beets and light weight. Of the 61 beets, whose analyses appear in Table II, 62 per cent weigh less than two pounds each, only one weighs as high as five pounds; four, four pounds each; two, three pounds each, and only sixteen weigh as much as two pounds each.

Many people made the mistake of sending for analysis the largest beets grown. This fact alone will account for many of the low sugar percentages. Experience has also shown that a beet of regular form, rather long and tapering, is, other things being equal, best adapted to the production of sugar.

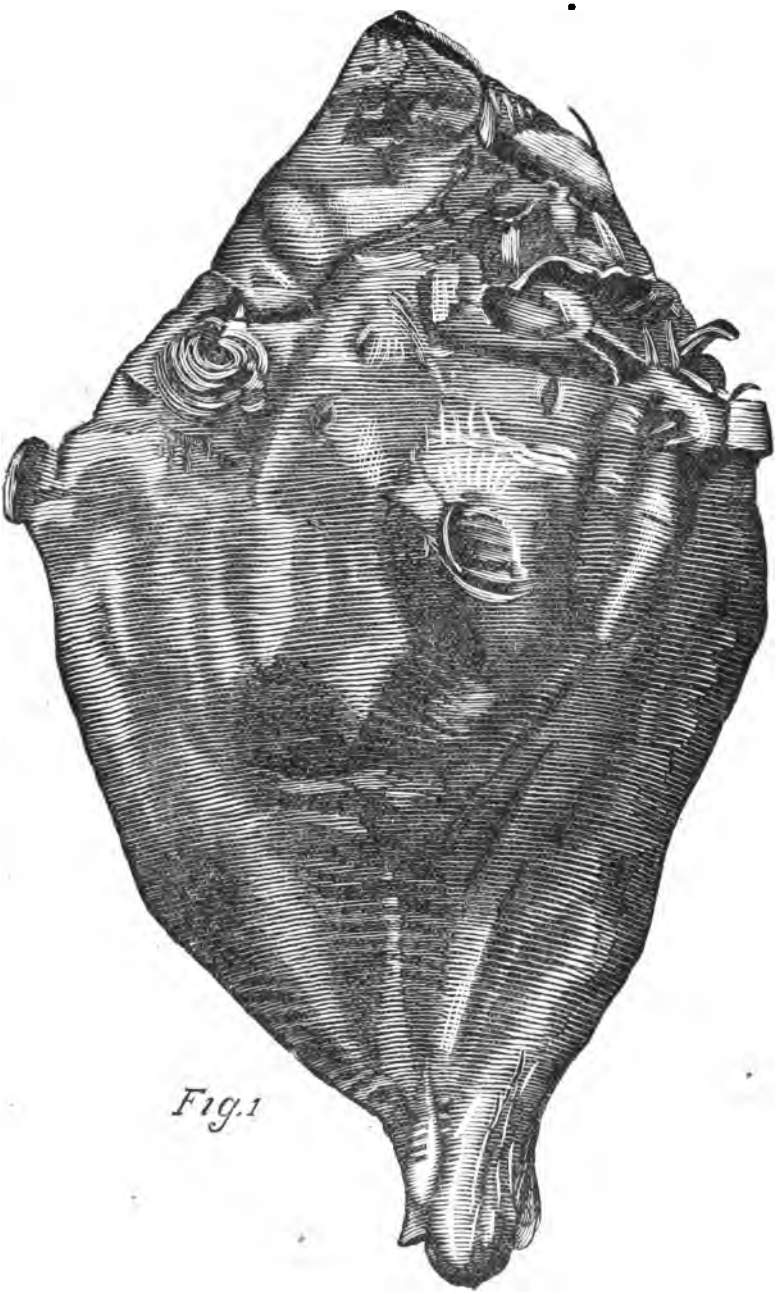


Fig. 1

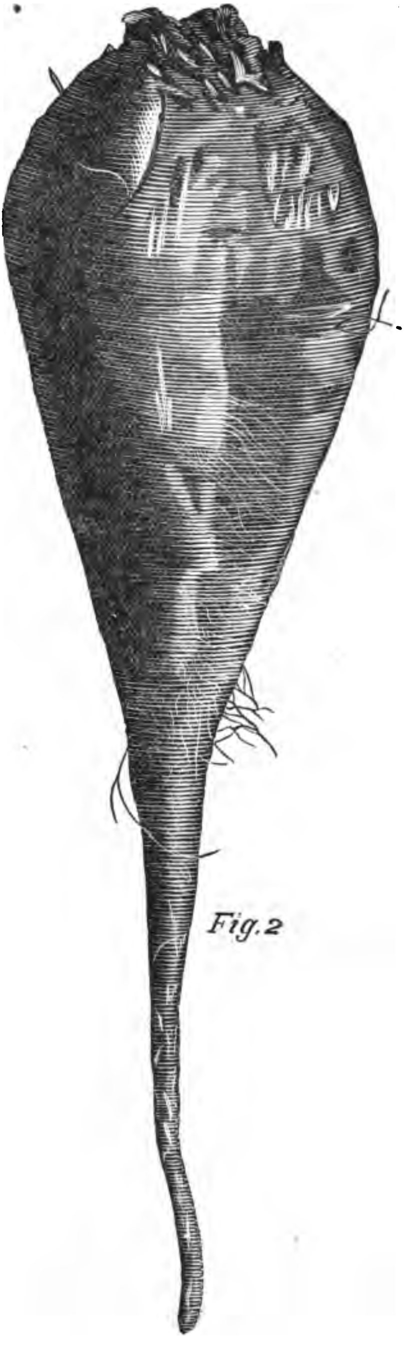


Fig. 2

For the purpose of illustrating this point we insert the foregoing cuts, representing two classes of beets received here this summer:

Fig. 1 shows a large, coarse, woody beet, giving a small percentage of sugar.

Fig. 2 is a much smaller beet, regular in form, with a long, tapering body, and, as a rule, rich in sugar.

## YIELD AND COST.

By reference to the circular (page 304), it will be seen that an attempt was made to obtain definite information on these points. It was with but faint hopes of success that these questions were asked, as to answer them would necessitate the planting of a measured plat of ground and the keeping of a careful account of the time and labor expended upon it. The detailed statements of individual growers (pp. 304–322) show that this was not done. We are obliged therefore, to look to other beet-growing localities for this data.

That official figures might be given, a letter was addressed to the Hon. J. J. Tobin, commissioner of labor and statistics of California, asking for this information. The letter and Mr. Tobin's reply appear below:

DEPARTMENT OF CHEMISTRY,
UNIVERSITY OF NEBRASKA.
POSTOFFICE BOX 675.

*Hon. J. J. Tobin, San Francisco, California:* DEAR SIR—Will you kindly furnish us with the statistics in regard to the sugar-beet industry in your state? We wish particularly to get at facts in regard to yield, cost of raising, and price received by the farmers at the factory. Any facts in regard to your temperature and rainfall will be very acceptable. Respectfully, H. H. NICHOLSON,
*Director of the Chemical Laboratory.*

SAN FRANCISCO, February 11, 1890.

*H. H. Nicholson, Esq., University of Nebraska:* DEAR SIR—Last April I furnished Mr. John Jenkins, deputy labor commissioner of Nebraska, with the statistics you now ask for. By applying to him you will no doubt get the information you want. Write to the secretary of the State Agricultural Society of California (Sacramento) for a report which contains information about temperature, rainfall, etc. Yours truly, J. J. TOBIN.

On applying to our Bureau of Labor and Statistics, we were very kindly given the following letter to the Marysville *Appeal*, which, though not official, gives valuable information:

WATSONVILLE, April 1, 1889.

EDITOR APPEAL: In your paper of the 24th ult. "A Farmer" compares beets with potatoes, and from the figures he gives draws a conclusion unfavorable to beets and favorable to potatoes. Before I discuss his figures I will remark that his standard of comparison is a bad one for this valley, as nearly every one lost on potatoes.

I differ considerably from all "Farmer's" figures. He begins by setting the price paid for beets at $4 per ton, which is too low. The average, last year, for the crop of 14,000 tons was $5.04: of this 7,000 tons were delivered before the fall rains set in, and averaged $5.50 per ton. As in future the factory will receive the entire crop before the rainy season begins, I think it is fair to take the latter rate as an average.

I hardly know what the "Farmer" means by "digging beets." I see he estimates the cost at $1.50 per ton, so I suppose it is to be done by manual labor. Here they do not dig them at all, but plow them out with a plow especially made for that purpose. A man and two horses can plow out two or three acres per day, and besides an enormous saving in labor, the crop will be about 5 per cent larger, as in digging by hand the spade cuts off the end of the root, which is left to waste in the ground. The beets thus loosened are pulled up, the loose dirt shaken off, laid in rows ready for topping. A woman in Germany will top about four tons a day; the American laborer, after a little practice, should certainly equal this. Reckoning wages at $1.50 gives 40 cents for topping, 15 cents for plowing up, and 15 cents for loading into wagon, making a total of 70 cents per ton.

This amount was not exceeded by many practical farmers last year. I will now take the hauling, the expense of which is set down by "Farmer" at $1.50 per ton. It may surprise "Farmer" to learn that at this rate many patches were not only hauled, but also plowed and topped, by contract, and the contractor made money. The hauling was done here partly by the farmers themselves and partly by teamsters. The price paid for hauling one to two and one-half miles was 50 to 75 cents per ton. These teamsters considered this good wages. I infer that it costs a little less for the farmer to do it with his own team.

Taking 70 cents for plowing up, topping, and loading into wagon, and 75 cents for hauling, makes (at "Farmer's" estimate of twenty tons to the acre, which is a fair yield for bottom land) the cost of harvesting $29 per acre; reckoning the beets at $5.50 per ton leaves $81 per acre, plowing, planting, and thinning. In support of the above I will give you the results of beet raising of a few farmers here.

In all instances the work done by the farmer himself, or by his teams, is reckoned at the price he would have to pay for hire, so the actual profits are rather larger than they appear. I may add that all the gentlemen named have contracted for an increased acreage this year.

F. Therwachter, Watsonville, three miles from factory, ten acres; plowing, etc., $50; thinning, $190, topping, $133; hauling, $150; total, $523. Yield, 154 tons; value, $972.80; net profit, $449.80; profit per acre, $44.98.

W. M. Gorham, Watsonville, one and one-half miles from factory, five acres; plowing, etc., $24; thinning and hoeing, $90; topping, $115.20; hauling, $85; total, $282.20. Yield, 132 tons; value, $570.81; net profit, $314.20; net profit per acre, $51.32.

J. B. Hudson, one mile from factory, ten acres; expense of cultivation and harvesting (no details given), $614.83. Yield, 260 tons; value, $1,304.96; net profit, $692.13; net profit per acre, $69.21.

T. Mitchell, one mile from factory, six acres; plowing, etc., $30; thinning, $96; topping at 75 cents per ton, $108; hauling, at 50 cents, $72; total, $306. Yield, 144 tons; value, $621.26; net profit, $315.76; net profit per acre, $52.62.

A. F. Richardson, two miles from factory, eleven acres; plowing and harrowing, $110; sowing, $6; harrowing and sowing, $3; four days' cultivation, first time, at $2—$8; twenty-three days' thinning at $1.25—$28.75; twenty-four and a half days' thinning and hoeing at $1.25—$30.65; five days' hoeing at $1.25—$6.25;

nine days' hoeing at $1.75 — $15.75; seven days' hoeing at $1.75 — $12.25; nine and a half days' hoeing, second time, at $1.75 — $16.66; one day's hoeing, second time, $1.75; four days' hoeing, second time, at $1.75 — $7; fixing plow, $2.50; two knives, $1.50; four baskets, $3.50; topping and loading, 170 1-20 tons at 80 cents — $136.04; hauling at 50 cents — $85; plowing up at 20 cents — $34; total, $508.59. Yield, 170 1-20 tons; value, $921.81; net profit, $413.22; net profit per acre, $37.56.

These results speak for themselves and were obtained when everybody was new to the enterprise. With the experience gained, and by the help of new machinery, I am confident that every one of the expenses will be reduced, and that every succeeding year will establish sugar-beet raising as one of the most important and profitable of California industries. P. W. M.

Statistics of this kind, while they may not fit exactly to our conditions, are of more value to us than those from foreign countries where the conditions of soil and climate are so different from ours. It is hoped that during the coming season those interested in the sugar beet question, who plant seed, will in all cases plant measured plots, one-tenth, one-half, or one-acre lots. Then, by keeping an accurate account of all time and labor applied to the crop and a record of the quantity of beets raised, we can approximate, very closely, next year, to cost, yield, and profit, when beets are cultivated on a large scale, as a matter of business.

## SOIL AND CULTIVATION.

Formerly it was supposed that there existed a more or less intimate relation between the sugar content of the beet and the chemical composition of the soil in which it was grown. That this is an erroneous idea, or at least, that this relation is of less importance in the production of sugar than is the fact of thorough cultivation, is shown by the following table of analyses of German, French, and Nebraska soils:

| CONSTITUENTS. | German* average of nine analyses of mineral constit'nts | FRENCH.* | | | NEBRASKA. | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Somme* | *Nord.* | *Aisne.* | *Dawes county.* | *Cherry county.* | *Brown county.* | *Antelope county.* | *Saunders county.* | *†Lancast. county.* | *Hamilton county.* |
| Moisture | ...... | ........ | ........ | ........ | 2.5500 | 1.3730 | 1.8060 | 1.8985 | 1.8760 | 3.2820 | 3.5360 |
| Vol. and org. matter, | ...... | 5.600 | 4.840 | 5.700 | 4.5200 | 4.7930 | 6.0003 | 5.9022 | 9.2618 | 6.8140 | 8.0130 |
| Silica | 43.87 | 81.800 | 82.500 | 79.000 | 83.9970 | 87.0487 | 81.2330 | 83.4182 | 78.4751 | 79.8400 | 83.7560 |
| Iron oxide | 29.75 | 2.880 | 2.180 | 3.560 | 1.1480 | 1.4734 | 1.5960 | 2.3679 | 1.2629 | 4.9810 | 1.3290 |
| Alumina | 42.40 | 7.240 | 8.620 | 8.500 | 2.7450 | 3.3865 | 6.3840 | 3.6922 | 7.2572 | 1.9200 | 1.1300 |
| Lime | 14.57 | 0.510 | 0.420 | 0.250 | 1.8920 | 0.4983 | 0.7730 | 0.5950 | 0.4900 | 0.6120 | 0.4684 |
| Magnesia | 5.47 | ........ | ........ | ........ | 0.2050 | 0.0846 | 0.0600 | 0.0315 | 0.3345 | 0.4200 | 0.4390 |
| Potash | 5.93 | 0.064 | 0.141 | Trace | 0.0410 | 0.4107 | 0.7410 | 0.5927 | 0.2413 | 0.1970 | 0.0541 |
| Soda | 3.86 | 0.085 | | | 0.0500 | 0.3341 | 0.40 0 | 0.2676 | 0.2037 | 0.1240 | 0.0551 |
| Phosphoric acid | 0.76 | 0.070 | 0.077 | Trace | 0.8220 | 0.0623 | 0.0620 | 0.0399 | 0.1127 | 1.4210 | 0.0947 |
| Sulphuric acid | 0.63 | ........ | ........ | ........ | 0.0007 | 0.3799 | 0.0970 | 1.1600 | 0.5790 | 0.0 55 | 0.0620 |
| Carbonic acid | 6.72 | 0.400 | 0.700 | 2.850 | 1.7120 | 0.9057 | 1.1800 | 0.0721 | 0.6152 | 0.1600 | 1 0040 |
| Chlorine | 0.21 | ........ | ........ | | 0.0058 | 0.0088 | 0.0089 | 0.0278 | 0.0028 | 0.1510 | 0.0011 |
| Manganese oxide | 0.92 | ........ | ........ | | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Other matter | ...... | 1.851 | 1.523 | | ........ | ........ | ........ | ........ | ........ | ........ | ........ |
| Nitrogen | ...... | ........ | ........ | ........ | 0.0840 | 0.0560 | 0.0735 | 0.0630 | 0.0710 | 0.0700 | 0.0680 |

*The Sugar Beet, pp 103-4.

†University Campus.

The German and French analyses are of soils that produce excellent beets, notwithstanding their difference in composition. The Nebraska analyses, also, represent soils that have this year produced beets rich in sugar. The differences in composition here exhibited are another indication that there is more virtue in good cultivation than in mere chemical composition, or differences in climatic conditions.

Deep, mellow, well-drained soils are theoretically the best for sugar-beet growing. Such soils are easily permeable by air and moisture, are not readily affected by drouth, and offer but little resistance to the downward growth of the root. Heavy, clay soils, new and very rich soils are underlaid by a stratum that does not permit the surplus water to drain off readily, are not well adapted to the production of beets for sugar.

Again referring to Table I, we find, almost without exception, that the soil in which this season's beets have been grown is reported as some variety of loam, usually sandy loam. Such facts as these recommend to the farmer, for his next season's planting, his old, cultivated, light soils, rather than newer land, especially that in which clay predominates. It goes almost without saying that deep plowing and thorough pulverization—"garden cultivation"—is required for beets, if we wish to make them produce much sugar.

As to the matter of fertilization, the opinion is prevalent that our new and naturally rich soils do not require it. A moment's thought will recall the fact that every crop removes from the soil some of its stock of plant-food, and that it is but a question of time when, if this is not returned, the best soil will become barren. Fertilizers have a twofold office. They restore, in other forms, the elements of fertility removed by crops, or they supply that in which the soil is naturally deficient, and act as modifiers to those constituents that exist in the soil in excess. It is rarely the case that we find a soil so well adapted by nature for a special crop that a judicious use of fertilizing material would not improve it.

Details of the best methods of cultivation and fertilization to follow in the cultivation of sugar beets in Nebraska must be learned by experience. The best general guide to follow in gaining this experience is the methods in use in the sugar-growing countries of Europe. This information has been very ably compiled, from official sources, by Dr. McMurtrie, when acting as representative of the Department of Agriculture to the Paris Exposition, in 1878; and is here reprinted from Special Report 28, Department of Agriculture.

"Vilmorin considers that any good soil that will grow wheat and corn, and has an arable stratum of twelve to fifteen inches, will be well suited to this culture; that where chalk exists in large proportion the yield will be small but the juice pure. All soils should be thoroughly drained, so that the tap root may not find stagnant water in the subsoil.

"It will appear that the physical characters of the soil which tend to render it best suited to the cultivation of the beet are porosity of surface and subsoil, to admit of drainage of superfluous water and of free circulation of the air, and power of absorbing and holding in a condition convenient for ready assimilation the elements of plant-food existing within it or coming from external sources. Unless the supply of these elements be continuous and regular, a purely sandy soil would be undesirable. If no means were provided for the removal of surplus water which might be found in a purely clay soil, or to so improve its condition as to admit of the free circulation of air as well as water, it is too heavy and becomes absolutely useless. The same is true of purely calcareous soils, since the same unfavorable conditions would prevail, though perhaps to not quite the same extent. These soils would also be unsuited to the plant itself, because they would not admit of the free progress of the tap root nor of the lateral fibrous roots in their search for nutrition or in following the natural course of development, and, as will appear later on, these conditions have a powerful influence upon the ultimate yield of sugar from the surface cultivated. But if the sandy soil described be mixed with either or both of the others mentioned, and with humus, in suitable proportions, the conditions most favorable to the maintenance of a regular and plentiful supply of food, the healthy condition of the root, and its consequent normal development, will be assured.

"The chemical character of the soil is of quite as great importance as its physical condition. For the proper development of the beet for the production of sugar, it should contain, in a suitable and assimilable form, all the elements usually necessary to the normal existence and development of plants, and attention must therefore be had to the conditions in which these substances exist in the soil. Phosphoric acid, potash, nitrogen compounds, and lime are especially necessary to the life of the plant, but if these exist in insoluble combinations on the one hand, or in the forms suitable for assimilation, but in excessive quantities, on the other, they will either be useless in the economy of nutrition in the first instance, or will stimulate the plant to abnormal growth unsuited to the ready extraction of sugar in the second. It is this branch of the subject that has occupied the attention and enlisted the energies of scientists and landed proprietors; and the influence of the different combinations of the various leading elements of plant food, and more especially, during later years, of nitrogen in the soil, has constituted the subject of frequent and continued investigation.

"Basset* says:

"'Soils charged with mineral salts are injurious to the culture of the beet for extraction of sugar, and are only suited to the cultivation of beets for distillation. In fact, we know that the beet easily absorbs saline matters, and that the alkaline salts constitute one of the greatest obstacles to sugar extraction.'

"New ground, or that lately cleared of forest, should not be applied to the culture of the beet, and it is considered by good authorities to be detrimental to the quality of the crop to make use of lands for this purpose that have not been under cultivation at least ten or fifteen years. This insures an almost complete removal of the nitrates and the organic matters containing nitrogen, which are always present in large quantities in new soils, and which it is well known exert an injurious influence upon the quality of the root.

"Basset, in his work,† gives elaborate tables of analyses of soils to show the chemical compositions of those most favorable to the culture, but we will here give the more succinct tables of Champion and Pellet,‡ showing the compositions of soils from different departments in the north of France in which beet-root culture is most extensively carried on, and of one from a similar section of Russia. Those numbered 1, 2, and 3 yielded beets of fair quality, containing 12 to 14 parts of sugar per 100 of juice, while that numbered 4 gave beets of bad quality. The last, that from Russia, is quoted by Walkhoff as being well suited to beet culture.

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* Guide Pratique du Fabricant de Sucre. †Id. ‡La Bettrave a Sucre, p. 82.

| | 1. Somme....... | 2. Nord....... | | 3. Aisne....... | 4. Somme....... | 5. Kalinofska soil....... |
|---|---|---|---|---|---|---|
| Organic matters | 5.600 | 4.42 | 4.840 | 5.70 | 8.200 | 6.207 |
| Silica | 81.800 | ............ | 82.500 | 79.00 | 42.000 | 72.699 |
| Alumina | 7.240 | ............ | 8.620 | 8.50 | 3.91 | 9.974 |
| Lime | 0.570 | 0.476 | 0.420 | 0.25 | 23.220 | 1.930 |
| Peroxide of iron | 2.880 | ............ | 2.180 | 5.50 | 2.310 | 2.834 |
| Phosphoric acid | 0.070 | 0.008 | 0.077 | Trace | 0.385 | 0.093 |
| Potash | 0.064 | 0.130 | 0.140 | Trace | 0.044 | 2.017 |
| Soda | 0.085 | | | ............ | 0.058 | 0.914 |
| Carbonic acid | 0.400 | 0.600 | 0.700 | 2.85 | 19.050 | 1.280 |
| Other matters | 1.351 | ............ | 1.523 | ............ | 0.823 | 2.022 |
| | 100.000 | 100.000 | 100.000 | 100.000 | 100.000 | 100.000 |
| Total nitrogen | 0.088 | 0.140 | 0.120 | 0.154 | 0.270 | 0.234 |
| Ammonia | 0.013 | 0.040 | 0.030 | 0.016 | 0.010 | ............ |
| Sand | 72.100 | 85.000 | 80.000 | 62.000 | 35.770 | ............ |
| Clay | 22.000 | 9.000 | 14.000 | 30.000 | 10 to 12 | ............ |

"The same authors quote Schubler as giving the following as the general composition of good soil for beet culture:

| | |
|---|---|
| Clay | 33.300 |
| Siliceous sand | 63.000 |
| Calcareous sand | 1.200 |
| Calcareous earth, humus | 2.500 |

"We now come to the study of the means employed to supply the deficiencies of plant-food in the soil, due either to the natural condition or the exhaustion by crops, and the influence of the means employed upon the production of rich and valuable roots.

"The general composition of the beet root and leaves is given by Champion and Pellet, as follows: they state that for rich beets the weight of leaves is about 50 per cent that of the root, and 25 to 30 per cent that of roots containing 9 to 11 per cent of sugar.

"The table shows the general composition of leaves and roots of beets containing 15 per cent of sugar:

| | *In roots, per cent.* | *In dry matter, per cent.* | *In leaves, per cent.* | *In dry matter. per cent.* |
|---|---|---|---|---|
| Water | 74.00 | ............ | 83.50 | ............ |
| Nitrogen | 0.40 | 1.55 | 0.38 | 2.30 |
| Ashes | 0.80 | 3.10 | 4.35 | 26.20 |

For a yield of 20 French tons* of beets and 10 French tons of leaves per acre, there would be removed from the soil:

| | *Nitrogen, pounds.* | *Total ashes, pounds.* |
|---|---|---|
| 20 tons roots | 178.1 | 356.2 |
| 10 tons leaves | 84.8 | 934.1 |

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*2,200 pounds

Or, for an average richness of 11 per cent of sugar:

| | *In roots, per cent.* | *In dry matter, per cent.* | *In leaves, per cent.* | *In dry matter, per cent.* |
|---|---|---|---|---|
| Water | 82.00 | ............ | 84.50 | ............ |
| Nitrogen | 0.25 | 1.39 | 0.38 | 2.45 |
| Ashes | 0.95 | 5.30 | 3.85 | 24.8 |

Or, for a yield of 20 French tons per acre:

| | *Nitrogen, pounds.* | *Total ashes, pounds.* |
|---|---|---|
| 20 tons | 110 | 418 |
| 6 tons | 50 | 508.2 |

"The composition of the ashes of the leaves and roots referred to, 1,000 parts green matter, is as follows:

| | *Beets surposed to contain 10 per cent sugar.* | | *Beets supposed to contain 15 per cent sugar.* | |
|---|---|---|---|---|
| | Leaves. | Roots. | Leaves. | Roots. |
| Potash | 9.23 | 2.93 | 10.0 | 2.66 |
| Soda | 3.23 | 0.51 | 3.47 | 0.45 |
| Lime | 3.50 | 0.42 | 3.75 | 0.38 |
| Magnesia | 2.81 | 0.38 | 3.03 | 0.33 |
| Chlorine | 3.23 | 0.57 | 3.47 | 0.50 |
| Sulphuric Acid | 1.50 | 0.22 | 1.63 | 0.19 |
| Silica | 0.31 | 0.34 | 0.33 | 0.30 |
| Phosphoric Acid | 2.23 | 0.59 | 2.40 | 0.51 |
| Undetermined | 2.03 | 0.16 | 1.92 | 0.13 |
| Total mineral matters | 28.07 | 6.12 | 30.0 | 5.45 |
| Total solids | 138.0 | 167.5 | 140.0 | 240.0 |
| Nitrogen | 3.3 | 2.5 | 3.8 | 4.0 |

"From these figures we may easily determine the quantity of the different constituents removed by average crops. Supposing the average to be twenty tons of roots per acre, the consumption of the different constituents would be, for beets of differing richness, as shown in the following table:

| | *For beets containing 10 per cent sugar.* | | *Total.* | *For beets containing 15 per cent sugar.* | | *Total.* |
|---|---|---|---|---|---|---|
| | Six tons leaves. | Twenty tons roots. | | Ten tons leaves. | Twenty tons roots. | |
| Potash | 121.8 | 128.9 | 250.7 | 220.0 | 337.04 | 117.04 |
| Soda | 42.6 | 22.4 | 65.0 | 76.34 | 96.14 | 19.8 |
| Lime | 46.2 | 18.48 | 64.68 | 82.50 | 89.22 | 16.72 |
| Magnesia | 36.1 | 16.72 | 42.82 | 66.66 | 81.18 | 14.52 |
| Chlorine | 42.6 | 25.08 | 47.68 | 76.34 | 98.34 | 22.0 |
| Sulphuric Acid | 19.8 | 9.68 | 29.48 | 35.86 | 44.22 | 8.36 |
| Silica | 4.09 | 14.96 | 19.05 | 7.26 | 20.46 | 13.2 |
| Phosphoric Acid | 29.43 | 25.96 | 55 39 | 52.80 | 75.24 | 22 44 |
| Undetermined | 26.79 | 7.04 | 33.83 | 31.24 | 36.94 | 5 70 |
| Total | 369.41 | 248.32 | 628.50 | 651.00 | 888.18 | 239.78 |
| Dry matter | 1,821.6 | 7,370.00 | ............ | 3,080 | ............ | 10,560 |
| Nitrogen | 43.56 | 110.00 | ............ | 83.6 | ............ | 176.0 |

"In France the general sources of supply of the various nutritive principles for the restoration of those removed by the crops, or to provide those required, are found in stable manure, seed cakes, animal wastes, woolen scraps, sulphate of ammonia, nitrates, superphosphates made from bones and minerals, potash salts, gypsum, and the scums and refuse from the sugar factories. Of all these substances, that which combines in itself in the highest degree all the elements of plant-food, and which is naturally the most economical, is the stable manure produced on the farm, and this being generally the result of keeping cattle to be fed upon the pulps from the factory, is one of the sources of real profit to the producer.

"Joulie gives the following as the composition of French stable manures of average quality, estimated in pounds per ton of 2,000 pounds:

| | *Manure of fifteen oxen.* | *Manure of ten cows.* |
|---|---|---|
| **Water** | 1,492.576 | 1,398.656 |
| **Organic matter** | 406.044 | 476.928 |
| **Mineral matter** | 101.380 | 124.416 |
| Total | 2,000.000 | 2,000.000 |
| **Nitrogen:** | | |
| Nitric | 0.000 | 0.000 |
| Ammoniacal | 1.880 | 1.334 |
| Organic | 11.822 | 11.950 |
| Total | 13.702 | 13.284 |
| **Phosphoric acid** | 5.288 | 3.142 |
| **Sulphuric acid** | 3.010 | 3.000 |
| **Chlorine** | 2.740 | 4.000 |
| **Potash** | 19.104 | 20.852 |
| **Soda** | 5.164 | 6.284 |
| **Lime** | 14.538 | 14.060 |
| **Magnesia** | 3.770 | 3.478 |
| **Oxide of iron** | 1.304 | 1.250 |
| **Sand and silica** | 39.888 | 60.913 |
| **Carbonic acid and loss** | 6.574 | 7.438 |
| Total | 101.380 | 124.416 |

"A comparison of this table with that given before will show that in order to supply in stable manure the required nitrogen and phosphoric acid for the production of an average crop of twenty tons per acre, it will be necessary to apply at least twenty tons of stable manure to the same area. But this quantity will contain a considerable excess of alkaline matters over the quantity demanded by the crop, and will only tend to increase the saline constituents of the root at the expense of the sugar. This excess of mineral matters is often used to explain the production of roots of low saccharine value. Let us bring together the figures for the constituents of plant-food mentioned, as found in twenty tons of stable manure from cows and as found in the yield of an acre giving twenty tons of beets:

| | *Manure, pounds.* | *Beet Crop.* |
|---|---|---|
| Nitrogen | 265.680 | 259.6 |
| Phosphoric acid | 62.840 | 75.24 |
| Potash | 417.040 | 337.04 |
| Soda | 135.680 | 96.14 |
| Lime | 281.200 | 89.22 |

"In practical work, therefore, it is found better to reduce the quantity of stable manures applied, and to supplement them with the other substances mentioned above. A comparison of the productive influences exerted by stable manures and by the artificial compounds usually employed to supplement it, or as substitutes for it, will be found in the following table, showing the results of the experiments made by Professor Deherain at the Grignon agricultural school, working with the Vilmorin improved race of beets. These results are interesting, as showing the advantage of moderate applications of stable manures, and the choice that should be made in the supplementary compounds that should be applied:

INFLUENCE OF MANURES ON YIELD IN WEIGHT AND RICHNESS IN SUGAR.*

| *No. of the plots.* | MANURE DISTRIBUTED PER ACRE. | *Yield per acre, tons.* | *Sugar in juice, per cent.* | *Sugar produced per acre, pounds.* |
|---|---|---|---|---|
| 1 | 9 tons stable manure | 9.2414 | 12.67 | 2,351.80 |
| 2 | 18 tons stable manure | 8.8893 | 12.58 | 2,228.60 |
| 3 | 36 tons stable manure | 8.4378 | 11.28 | 1,896.59 |
| 4 | 36 tons stable manure and 890.7 pounds superposphate of lime | 8.7220 | 12.26 | 2,187.78 |
| 5 | Without manure | 6.1980 | 14.58 | 2,257.04 |
| 6 | 356 pounds nitrate of soda, distributed in one sowing | 8.4378 | 12.75 | 2,184.01 |
| 7 | 356 pounds nitrate of soda, distributed in four sowings | 8.7660 | 12.75 | 2,234.79 |
| 8 | 356 pounds nitrate of soda and 356 pounds superphosphate, in one sowing | 9.1220 | 13.23 | 2,415.46 |
| 9 | 356 pounds nitrate of soda and 356 pounds superphosphate, in four sowings | 9.9235 | 13.08 | 2,568.24 |
| 10 | 1,068 pounds nitrate of soda, distributed in four sowings | 8.5230 | 12.43 | 2,367.40 |
| 11 | 356 pounds sulph. of ammonia, distributed in one sowing, | 8.4378 | 13.89 | 2,336.25 |
| 12 | 356 pounds sulphate of ammonia, distributed in four sowings | 7.7985 | 12.75 | 1,962.45 |
| 13 | 356 pounds sulphate of ammonia and 356 pounds superphosphate, in one sowing | 6 5860 | 13.08 | 1,722.15 |
| 14 | 356 pounds sulphate of ammonia and 356 pounds superphosphate, in four sowings | 6.9360 | 13.08 | 1,827.17 |
| 15 | 356 pounds superphosphate without nitrogen or manure | 7.5205 | 13.24 | 1,990.94 |
| 16 | 1,068 pounds sulphate of ammonia, in four sowings | 6.4970 | 12.42 | 1,693.57 |

"Joulie † also found, in his experiments with stable manures and the different fertilizing compounds made according to his formula, that the largest yield was obtained with the complete manure containing all the leading elements. The next best yield was secured with the complete manure without potash; the next with nitrate of soda alone. The yields with the others decreased regularly in the order in which they are named: without phosphate and without lime; with sulphate of ammonia; with stable manure; with nothing; with guano. From his experiments he concludes as follows:

"'1. The manure especially suited to the beet and which establishes the best conditions, as well for the yield per acre as for quality, is the complete manure B, of which the following is the composition:

| | *Per cent.* |
|---|---|
| Nitric acid | 6.500 |
| Phosphoric acid, {assimilable<br>insoluble} | 6.500 |
| Potash | 8.000 |
| Soda | 9.000 |
| Lime | 14.800 |
| Water, sulphuric acid, silica, and other accessory elements | 55.200 |
| Total | 100.000 |
| The nitrogen corresponds to ammonia | 8.000 |
| The phosphoric acid corresponds to tricalcic phosphate | 14.200 |

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*Journal des Fabricants de Sucre, November 13, 1878.

† Guide pour l'achat et l'Emploi des Engrais Chimiques, pp. 250 and 251.

"'2. In soils provided with potash, it (the manure B) is advantageously replaced by the manure F,* which differs only in the substitution of soda for potash.

"'3. These two manures should be applied at the rate of 400 pounds per acre upon soils in good condition and without stable manures.

"'4. Stable manure, applied at the rate of 20 to 25 tons per acre in the same year that the crop is grown, constitutes a bad condition, which is prudent to avoid. It is better to reduce the stable manure to 10 or 12 tons and supplement it with a suitable addition of chemical manures. Thus putting the minimum of salts, particularly of potash, at the disposition of the roots, a better quality will be obtained.

"'5. If stable manure be applied at the rate of 10 or 12 tons per acre, which rate it has been found advisable not to exceed, the manure F without potash should preferably be employed at the rate of 200 pounds for good soils and 400 pounds for poor soils. We thus avoid excess of potash, and establish between the useful elements an equilibrium favorable to the crop.

"'6. If fossil phosphates have been added to the stable manure after the method suggested by Baron P. Thenard, the manure F may be replaced by nitrate of soda at the rate of 260 pounds per acre for good soils and a maximum of 350 pounds for poor soils.

"'7. In no case should salts of potash (nitrate, sulphate, or chloride) be added to stable manure, which is always sufficiently rich in this element.'

"From these and later experiments, Mons. Joulie concluded, in general, concerning nitrogen of various compounds in its relation to the beet root and the influence upon its sugar content, that the nitrogen of the nitrates is more effective than that of ammonia, which in its turn is more valuable than that of organic matter.

"This difference in the elements of plant-food has also been noticed and determined by other workers, who have arrived at conclusions quite as marked as those of Joulie just given. Pagnoul† states that experiments made at Arras and elsewhere lead to the following concerning the use and abuse of nitrogenous compounds:

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* The conclusions of Professor Joulie will be better understood if reference is made to the following table, showing the composition of the fertilizers, made according to his various formulæ:

| DENOMINATION OF MANURE. | NITROGEN. | | | PHOSPHORIC ACID. | | | *Potash*......... | *Soda*......... | *Lime*......... | *Accessory elements*... |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Ammoniacal.* | *Nitric*......... | *Total*......... | *Assimilable*... | *Insoluble*.... | *Total*......... | | | | |
| A complete.................... | 4.14 | 2.36 | 6.50 | 5.00 | 1.50 | 6.50 | 8.00 | ......... | 17.00 | 62.00 |
| B complete.................... | ......... | 6.00 | 6.00 | 5.00 | 1.50 | 6.50 | 8.00 | 9.00 | 14.80 | 55.20 |
| C complete.................... | ......... | 4.00 | 4.00 | 5.00 | 1.50 | 6.50 | 14.00 | ......... | 19.00 | 56.50 |
| D complete.................... | ......... | 2.50 | 2.50 | 8.00 | 2.50 | 10.50 | 8.00 | ......... | 20.00 | 59.00 |
| E without potash............ | 6.50 | ......... | 6.50 | 5.00 | 1.50 | 6.50 | ......... | ......... | 19.50 | 67.50 |
| E concentrated............... | 9.00 | ......... | 9.00 | 9.00 | 2.00 | 11.00 | ......... | ......... | 12.00 | 68.00 |
| E without potash No. 2..... | 3.00 | ......... | 3.00 | 14.00 | 2.00 | 16.00 | ......... | ......... | 22.00 | 59.00 |
| F without potash............. | ......... | 6.50 | 6.50 | 5.00 | 1.50 | 6.50 | ......... | 14.00 | 15.80 | 57.20 |
| G without nitrogen.......... | ......... | ......... | ......... | 5.00 | 1.50 | 6.50 | 10.00 | 3.00 | 20.00 | 60.50 |
| G without nitrogen No 2.. | ......... | ......... | ......... | 12.00 | 2.00 | 14.00 | 5.00 | 1.50 | 20.00 | 59.50 |

† Journal des Fabricants de Sucre, 1878, October 13.

"'1. Abuse of all nitrogenous compounds, nitrates, stable manures, seed cake, etc., is always injurious to the quality of the beet.

"'2. Excess of nitrates by application before sowing is less injurious than excess of nitrogenous manures of organic origin. In fact the first are at once absorbed by the young plant favoring the development of leaves. On the contrary, the others act slowly and in decomposing may undergo nitric fermentation, which favored by meteorological conditions, such as probably existed in 1875 to 1876, creates in the soil an abundance of nitrates, the retarding action of which impoverishes the root in the last days of growth.

"'Concerning stable manure, it is a fact that there is no necessity for prohibiting its use, because growers are generally wanting it, and they will not be tempted to use it in excessive quantity to the same extent as they may be induced to use the mineral manures. But it is useful to show that this excessive use, if it were possible, would be even more fatal than the use of nitrates, as regards the quality of the root.

"'3. For the same reason the use of nitrates after sowing, and especially in the months of August and September, is absolutely bad, and may be characterized as fraudulent.

"'4. The abuse of nitrogenous manures, nitrates, and others, is much less fatal when used upon rich varieties, and roots closely planted, than upon poor varieties and roots planted at greater distances.

"'5. The causes to which the bad quality of the beets in our region (department of Pas-de-Calais) should be attributed, are, * * * the too great richness of our soils in nitrogenous matters, the abuse of manures, and the application of nitrates after sowing.'

"Concerning stable manures and the other nitrogenous manures used, M. Georges,* in a lecture on beet root culture, advises that the quantity of stable manure should not exceed 10 to 15 tons per acre, since this quantity will supply sufficient of salts for the needs of the plant. Nitrogen, being the deficient constituent, should be supplied by some very soluble and easy assimilable compound, such as from 250 to 350 pounds per acre of nitrate of soda, with an addition of a like quantity of superphosphate of lime, the latter element especially intervening to increase the richness in sugar. The prejudice against nitrate of soda is unjust. Judiciously applied it is useful. Only its abuse is disastrous, but neither more or less than the excessive use of all others, and even stable manure worked into the soil previous to sowing; it hastens the vegetation of the plant at the start, and helps it through the first stages of growth. When it is exhausted, the stable manures, by their slow decomposition, supply the subsequent demands of the plant. But nitrate of soda should not be applied during the growth of the plant, because it may then remain in nature in the adult beet, which will not have time to elaborate it and secure all the useful effect. Sulphate of ammonia, with an equal quantity of nitrogen, seems to be less favorable than nitrate of soda, because it is a salt which tends to rise to the surface in the soil, while the other descends to an equal extent. Other matters, such as seed cakes, woolen wastes, etc., may be substituted for the nitrates, but they should in all cases be worked into the soil before sowing, that they may have time to decompose in advance, and may be thoroughly mixed through the entire arable stratum.

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*La Sucrerie Indigene, 1878.

"These ideas expressed by M. Georges were reiterated by M. Drouyn de l'Huys,* and express the views of all scientists and cultivators in France. But while all admit the value of the judicious application of the nitrates, it appears also to be the universal opinion that it should be accompanied by the application of a corresponding quantity of the phosphates, which have a tendency to counteract any prejudicial influence that the nitrates may exert by hastening the maturity of the plant and increasing its sugar content. This fact has been very nicely elaborated by Professor Maercker, of Halle, in a lecture lately delivered upon the subject of beet culture, an abstract of which may be found in the Journal des Fabricants de Sucre. He says it is a well-accepted fact that strong doses of nitrogenous manures are injurious to the beet crop, in that it increases the weight of the non-saccharine contents and reduces the sugar. The discredit into which the use of nitrates has fallen is due to its abuses and the manner of applying it. The difficulty appeared to be to determine the quantity to use and the best time to apply it. When applied too late it retards ripening. Applied in the spring the plant develops vigorously in leaves and root, and the period of growth is lengthened. So strongly nitrogenous manures always produce growth.

"But the sugar-beet must ripen to accumulate sugar within it. Its growth should therefore be arrested to admit of ripening, which late distribution of nitrates prevents. At Magdeburg part is applied in the fall and the remainder before the preparation of the soil in spring. Heavy doses of strongly nitrogenous manures also necessitate heavy doses of phosphoric acid to annihilate the injurious effect of an excess of nitrogen. Phosphoric acid, applied in large quantity, induces early ripening of the plant. A mellow, permeable, clay soil may receive doses that would be injurious to a cold soil.

"Pagnoul has developed by his researches and observations that phosphoric acid gives varying results. In some soils no appreciable effect can be noticed, while in others its use has been found very favorable, and these differences are attributed to the greater or less proportion of phosphoric acid already existing in the soil. Notes should therefore be kept on the effect of various measures in order to avoid unnecessary expense in their application. M. Decrombecque considers that in all cases the phosphoric acid in the soil should be increased as the nitrogenous principles increase, and Woussen considers phosphoric acid a corrective for the deleterious influence of nitrates, because upon soils where nitrate of soda has been applied in large doses it is only necessary to increase the proportion of phosphates of lime to secure good maturation of the crop which would otherwise remain green.

"Pellet† has advanced some interesting notions concerning the comparative values of the different elements of plant-food in their relation to the production of sugar in the beet, deduced from the study of analyses of different plants obtained by various persons in their experiments. Laws and Gilbert, discussing the analyses of wheats grown upon the Rothamstead farm, and of French wheats analyzed by Boussingault, conclude that wheat scarcely admits of a change in the composition of its ashes, whatever may be the composition of the fertilizers applied; the same is true of potatoes.

"But Pellet finds that the beet, on the contrary, may grow with equivalent substitutions of the alkalies necessary to the formation of sugar, so that, as shown by the experiments of Joulie, soda may be found in the ash of some beets in the same quantity as potash, while in others the quantity of potash is seven times that of soda. This substitution may also be noticed between lime and potash, but experience shows that although the alkalies may thus substitute each other, and lime, by equivalents, certain other bodies, such as phosphoric acid, will not admit of being replaced. The experiments of Champion and Pellet also show that in all plants we may observe a relation between the total weight of ashes and the special organic matters for which the plant is cultivated. Thus, in wheat between the starch and total ash, and in the beet between the sugar and total ash. They construct the following table, showing in general that for the formation of 100 pounds of sugar in beets the roots and leaves in their development must consume

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* Compte-rendu des Seances du Congres Agricole et Sucriere tenu a Compiegne, Mai, 1877.

† Journal des Fabricants de Sucre, October 2, 1878.

"1 to 1.20 pounds of phosphoric acid.
"5 to 6 pounds of potash.
"1.5 to 2 pounds of soda.
"1.5 to 1.6 pounds of lime.
"1.2 to 1.4 pounds of magnesia.
"2.7 to 3.5 pounds of nitrogen.

"Excess of all may be present in the soil, but if phosphoric acid be wanting, sugar will not be produced, while if lime is wanting, it will be replaced by potash, or soda, or magnesia, and this rule holds good for the other alkalies. The author therefore concludes that 1 of phosphoric acid corresponds to 100 of sugar, while 5 to 6 of potash corresponds to the same amount, and consequently phosphoric is worth five or six times more than potash in the formation of sugar, if potash replaces no other alkalies; in other words, if a soil be wanting in 60 pounds of assimilable potash per acre, there will be a deficit of 1,000 pounds of sugar, while for the same deficit only 10 pounds of assimilable phosphoric acid need be wanting. Phosphoric acid he considers a non-dominant but indispensable element or base for the formation of sugar in the beet.

"Reasoning from these data, they conclude that without experiment, but by examination of the average composition of the ashes and of the quantity of nitrogen in the plant, and comparing the total weight of the different constituents with that of the given proximate principle to be produced, for instance, sugar in the beet and starch in wheat and potatoes, it is possible, they say, to determine the order in which the elements of plant-food are indispensable for each plant. Thus, for the beet they range: 1, phosphoric acid; 2, lime or magnesia; 3, nitrogen; 4, potash or soda. On the other hand, the order for wheat is: 1, lime or magnesia; 2, potash; 3, phosphoric acid, etc. These are facts of great importance in the economy of providing supplies of plant-food, and they will aid greatly in the selection of the compounds to be employed for the fertilization of various crops.

"From what precedes and what we learn from the long-established practices followed in France the application of fertilizers to the land on which beets are to be produced, it appears that nitrogenous organic compounds, insoluble in water, should be worked into the soil a long time in advance of the crop, and that to enjoy a beneficial result from their use they should be distributed at least during the autumn preceding the season of planting, and for stable manures it is preferable that they be given a preceding crop, which in France is generally oats or potatoes.

"Stohmann* says it is generally recognized, as a rule, that the sugar beet should never be cultivated upon a fresh manure or barn-yard manure, because this system of culture gives a large yield in weight, but roots so rich in foreign matters that they cannot be worked with profit. The beet should always form the second rotation when the manure is strong.

"Other organic nitrogenous compounds, such as seed cakes, refuse animal matters, and even ammonia salts, may be applied in the fall or in the very early spring, while the nitrates, which are more soluble, may be applied either immediately after planting.

"In no case should the latter be applied during the period of growth, on account of its influence, as shown by numerous experiments, to retard the time of ripening, and the consequent maximum development of sugar.

"The quantity of stable manure per acre that may be applied to land to produce the most favorable effect seems in France to be from eight to fifteen tons, according to the character of the soil, and it is generally more profitable to use a smaller quantity and supplement it with nitrates and phosphates. The value of lime in its relation to the beet is no less than for other crops. Its disintegrating influence upon the nitrogenous organic matters is as important as its power to take the place of other alkalies which may be wanting. In fact, on account of this property, many of the most intelligent growers are inclined to use it, and by means of it to avoid in the juice many of the more objectionable soluble salts that the alkalies are likely to introduce. Another important consideration in its low market value, and the convenience of its application. At the same time, deficiencies of the other alkalies in the soil should not be overlooked, and they should be in all cases made up.

"It is scarcely necessary to further call attention to the importance and value of the phosphates in connection with this crop, after all that has been said. They may be applied at all times, and many growers consider it of advantage to distribute small quantities with each working or hoeing. The general method, however, is to distribute it in advance of the last plowing, in the course of which latter operation it becomes distributed throughout the entire arable layer. But if applied in the spring, it is considered by many that it should be deposited in the rows with the seeds, and M. Derome is of the opinion that 100 to 250 pounds per acre applied in the rows will produce quite as good effects as 400 to 800 applied broadcast. He concludes from all his experiments, the results of which are confirmed by those obtained by Corenwinder, Pagnoul, Ladureau, and others, that artificial fertilizers worked in with the plow will give an average of about three tons more of beets than the same quantity of manure applied on the surface and worked in with the cultivators.

"The next consideration in the culture of the beet is the improvement of the physical qualities of the soil, and its preparation for the crop. The importance of drainage, etc., has already been referred to in review of the inherent physical qualities of the soil which make it suited to this crop, and we may therefore proceed at once to the consideration of its manipulation to bring it to the favorable conditions before quoted. And we shall first of all review the ideas advanced on this subject by some of the later writers who may be considered good authorities.

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*Journal des Fabricants de Sucre, November 20, 1878.

Briem* says:

"'The development of the beet depends, in the first place, upon good preparation of the soil, and its continued and careful maintenance. A preparation carefully effected brings about a mellowing of the soil, access and change of air and water, destruction of weeds, and deep growth of the root. Deep plowing (with steam where this is possible) is a first condition of a rational culture. This operation should be effected in advance of winter. Subsequent cultivation should not be spared. It improves the size and quality of the plant, and should be repeated as often and as long as the leaves will permit. The more the culture approaches that of a garden, the more the quantitative and qualitative yield will be increased.'

"According to Stohmann, beets do better after well-manured gramineæ. They naturally find place in rotation after wheat or barley. In some cases beets have been produced two years in succession, but this is possible only in exceptional cases. It is injudicious to recommend a rotation of beets of less than two years. Immediately after a crop of cereals, the ground is broken up. In the fall, plow as deeply as the nature of the soil will permit, and leave the field with the furrows thus exposed during the winter to atmospheric influences. In the spring, prepare the soil for sowing by means of the roller and harrow; and in order not to lose the accumulated moisture of winter, avoid, as far as possible, plowing again in the spring.

"Vilmorin† directs to begin with an ordinary plow in the fall, followed by a draining plow, so that the ground will be broken up to a depth of six or eight inches; and plow in the spring, and follow with harrow and roller. We cannot more clearly give the prevailing opinions of French growers upon this matter of preparation of the soil than is expressed in the discussion on the subject in the meetings of the agricultural and sugar congress held at Compiegne in May, 1887, and published in the report of proceedings; and I therefore present below a translation thereof:

"'M. Boursier said that it is, above all, necessary to work the ground and put it in such condition that it may be at the same time permeable and firm enough to adhere to the roots. This is effected by deep plowing, and energetic harrowing and rolling. It would, nevertheless, be useful to elucidate this point, whether it is better to give a single deep plowing in autumn, followed by cultures with the scarifier and harrow in the spring, or to give the several plowings, the first in advance of winter and the second immediately preceding sowing. For himself he considered it better to give a single deep plowing in the fall or winter.

"'M. Debains prefers the system which consists in first giving a plowing to break up the stubble, followed by another to bury the manure, and finally a third before sowing.

"'M. Blin said there was no necessity to have an absolute system with this regard. It would be dangerous to give a deep plowing to land having a shallow stratum of arable soil.

"'M. Decrombecque had not adopted deep plowing, for the nature of his soils would not permit it; but in order to submit the greatest possible surface of soil to the beneficial atmospheric influences, he practiced the method of ridging.

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* Journal des Fabricants de Sucre, October 23, 1878.

† Journal des Fabricants de Sucre, February 27, 1878.

" 'M. Boursier explained by deep plowing he did not mean absolutely to say fourteen or sixteen inches; plowing is considered deep when it exceeds by one or two, inches that of preceding culture. A plowing of ten inches would be deep in ground which had never been broken up more than eight inches; the depth is modified according to the soil.

" 'M. DeMot called attention to the excellent effects of breaking up without displacing the soil (*i. e.*, subsoiling). With this system the production is sensibly increased. The use of the draining plow should be strongly recommended.

" 'M. le Vte. de Chezelle called attention to the favorable effect of deep plowing shown by the vegetation on the sides of ditches opened for drainage.

" 'M. X. —— responded that this effect does not constitute an argument in favor of deep plowing. In fact, in drainage the vegetal earth is always returned to the top, while plowing brings the subsoil to the surface, and if this is not vegetal (fertile) it is evident that the operation is defective. He also insisted upon the use of the draining plow.

" 'M. Barral recognized the fact that deepening the arable layer is always advantageous in the long run, and he recommended attacking the subsoil only with precaution, and after taking into account its chemical composition. In this connection, as in the most of agricultural questions, it is impossible to fix an absolute principle, and it is always necessary to take account of circumstances. Besides it cannot be denied that the beet is one of the plants for which the depth of the arable layer is of the greatest importance.

" 'M. de Rouge has proven the excellent effects of deep plowing upon the poor clay soils of the extremity of the Aisne. Like M. Boursier, he counseled plowing in autumn. During the winter the land to be sown in the spring should be impregnated with the substances of the air and submitted to the favorable atmospheric influences. Broad furrows should be made in the first plowings given in autumn, because the more the earth is formed of large lumps the more the frost may penetrate by the wide spaces which separate them.

" 'M. Ch. Gossin remarks two unfortunate effects in the plowing which immediately precede sowing the beet: 1. This plowing stirs up the soil in the interior. Now, the beet does not like light soils. 2. By this plowing we bring to the surface a quantity of bad seeds, which germinate at the same time as the beet, and cover the ground with weeds, while if the ground be plowed in the fall, the seeds which germinate in the early spring are killed in the operations of culture which precede sowing. Therefore in the triple regard of contact, of atmospheric agents, of the mellowness, and internal cohesion of the soil and cleanliness of the ground, fall or winter plowing should be advised.'

"The method of preparation followed in practice by M. H. Vilmorin is as follows: Begin plowing in November and break up the land eight or ten inches, and follow this with a subsoil plowing to a depth of eight or ten inches more, so that the ground will be thoroughly stirred up to a total depth of at least fifteen inches. During the progress of this work, and as far as possible, the artificial fertilizer employed is distributed in furrows before subsoiling. The ground is then left in the rough condition consequent upon plowing, and after that is twice plowed in the spring, in February and April. It is finally prepared for sowing by harrowing and rolling.

"M. Champonnois considers it of advantage to prepare the ground in ridges before sowing, especially in working very shallow soils, in order to provide depth for the long, tapering root, and to put the ground in better condition for the circulation of air and water. He claims for his method of culture that it is less costly than the ordinary method, and gives a better quantitative and qualitative result. In his experiments he obtained forty tons of beets per acre, having an average richness of 10.50 per cent and a coefficient of purity above 83.

"The results ot his experiments in 1878 do not seem to be as good as those obtained in previous years, as shown by the following table:

| | *No. 1.* | *No. 2.* | *No. 3.* | *No. 4.* |
|---|---|---|---|---|
| Product per acre (tons) | 28.300 | 40.450 | 22.500 | 11.725 |
| Density of juice | 6°.17 | 5°.45 | 6°.75 | 7°.50 |
| Per cent of sugar | 11.37 | 9.61 | 14.90 | 16.91 |
| Quotient of purity | 69.70 | 66.69 | 83.94 | 86.00 |

OBSERVATIONS.

| *No. 1.* | *No. 2.* | *No. 3.* | *No. 4.* |
|---|---|---|---|
| Seed, four kinds; richest, 12½ per square meter; fresh manure two months before sowing; earth beaten slightly on April 23, and after the beets had four leaves; complete manure, 200 pounds per hectare; culture given regularly. | Same culture and care; four kinds of seed productive of weight; at November 1 beets were in full growth, due to kind of manure and time of its application; beets short and rooty. | Manure well rotted; plowed in ridges; well beaten by rolling; manure-residues of elution containing salts and nitrogen of molasses; culture regular throughout entire growth. | No manure plowed in; chemical manure, 625 pounds per acre, worked in; sowed late, culture continued throughout vegetation; quality good; quantity wanting, explained by late sowing. |

"However, in this matter of preparing the soil, as in all others, it appears that the grower, while following the genreal principles enunciated, must be guided by his own judgment and the character of the soil with which he has to deal.

"Sowing is generally effected by means of a drill especially designed therefor, but any drill that will deliver the seed regularly and in sufficient quantity will satisfy every purpose. The forms employed in France vary with the different inventions, but the spoon drill is the most common.

"The best time for sowing is considered to be the last week in April and the first fortnight in May, when the temperature should range from 50° to 60° Fahr. for at this temperature the seed will germinate most surely and most rapidly. The germinating faculty is materially increased by immersing it in water at 120° Fahr., and the beets produced are often richer in sugar on account of this treatment.

"Messrs. Champion and Pellet* give the following results of an experiment in growing seeds soaked in water and those not soaked:

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* La Bettrave a Sucre.

|  | DATE. | Av. weight, grams..... | Per cent of sugar in beets...... |
|---|---|---|---|
| No. 1, normal seed | August 31 | 400 | 16.4 |
|  | September 16 | 460 | 13.4 |
|  | September 29 | 580 | 17.0 |
| No. 2, soaked seed | August 31 | ........ | 16.9 |
|  | September 16 | 500 | 14.9 |
|  | September 29 | 580 | 17.2 |

"Besides this, the beets produced with soaked seed had a better form than those from normal seed.

"Various solutions have been suggested to be employed for soaking the seed, among others water slightly acidulated with nitric acid. Humboldt suggested very dilute chlorine water, but Duchartre showed that this was of no value.

"In many sections of France and Germany the juices flowing from the manure heaps are used for this purpose. They are diluted with an equal volume of water, and the seeds immersed in them for forty-eight hours. The seeds are after this taken out, mixed with ashes, and passed over a screen. After this treatment they may be put in bags and kept in a cellar or other cool place until needed. When ready to be sown they must be quite dry on the surface, in order that they may not adhere to each other in sowing. Other solutions for the purpose have been used in France and Germany, the values of which, Basset* states, range in the order in which they are named:

"1. Mixture of urine and water in equal parts.

"2. *Purin*, or manure juices, pure or dilute, for which may be substituted ordinary water in which has been macerated guano, fowls' or pigeons' dung, so as to obtain a solution of density of 1.015 or 1.020.

"3. Solution of nitrate of potash of 5 per cent.

"4. Solution of phosphate of ammonia of 2° B.

"5. Solution of superphosphate of lime of 2 per cent.

"6. Solution of 2 to 2.5 parts chloride of lime in 100 of water.

"7. Dilute acid solutions of 1 to 1½ per cent prepared only with hydrochloric, sulphuric, or phosphoric acids.

"Solutions of nutritive matters are considered more favorable to the purpose than pure water, because the latter in prolonged soaking will often remove from the seeds some of their soluble constituents. The length of time during which the soaking should be continued might vary somewhat, according to the temperature, but it is generally confined to 48 hours, and 24 are often consider sufficient. Basset states that during 24 hours seeds will absorb—

"69 per cent their weight of water at 39.9° Fahr.

"91 per cent their weight of water at 50.8° Fahr.

"95 per cent their weight of water at 60° Fahr.

"97 per cent their weight of water at 65° Fahr.

"Experiment has shown that seeds require, in a soil sufficiently moist and aerated, a total sum of degrees of average temperatures equal to 65° Fahr. for germination. Thus if the average daily temperature be 50°, 13 days will be required for germination; if it be 55°, then 12 days will suffice; and if 65°, only 10 days will be required. If, however, the seed be soaked for 24 hours in water at 100°, then the total sum of thermometric degrees, and consequently the number of days required for germination, will be correspondingly reduced. If they be soaked 48 hours at 100°, then only 9 days will be required for germination in the ground at an average temperature of 50°, and a correspondingly less time with a higher temperature.

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* Guide Pratique du Fabricant de Sucre.

"With regard to the best time for sowing them, Basset* directs as a rule: '*Sow as early as possible according to the temperature of your locality, whatever may otherwise be the method chosen.*' Thus, when the temperature of the air is from 50° to 54° Fahr. at noon, 46° to 50° in the evening, and 32° to 36° in the morning, sowing may be begun without fear of unfavorable temperature. This may be combined with observations of the temperature of the soil, which should at the same time have an average of about 45° at a depth of 4 to 6 inches.

"Concerning the depth to which the seed should be covered in the ground, opinions differ somewhat, but it will naturally follow that much must necessarily depend upon the temperature of the season, the physical condition of the soil, and the proportion of moisture. The seed requires the presence of oxygen for germination, and therefore, if the penetration and circulation of atmospheric air be rendered difficult or impossible on account of a close, hard character of the soil, this function cannot be exercised, and the seed will rot in the ground. If the soil be permeable and contain sufficient moisture, the depth of covering the seed will vary with the temperature. If this be too low, again, the seed will rot. But with a favorable temperature and a good physical condition of the soil, less attention may be given to the depth of seeding. However, it is considered a good rule not to bury the seed under any circumstances more than 1 to 2 inches, and experience has shown that at this depth, other things being equal, a higher percentage of the seeds will grow than at any other.

"In all the beet-growing districts of Europe the system of planting in rows has been adopted, but in later years the attention and experiments of the progressive men have been directed to the determination of the influence of the distance between the rows and the beets in the rows upon the yield per acre and the saccharine value of the crops. In earlier years the practice was to separate the roots to such an extent that each square yard of surface should be devoted to six roots, but the experience of later years has shown that it is better to increase the number for this surface to ten. The extent of separation must naturally vary with the character of the soil and the seed grown. If in rich soils the roots be widely separated from each other, they have at their disposition more of nutritive materials, and there is, of course, a tendency to the production of large roots, which, we have seen, will contain more of mineral and organic impurities and less of sugar. On the other hand, if grown more closely, the stock of nutriment is less, the beets are smaller and longer, and consequently richer. Yet, notwithstanding the smaller volume of the beet produced, the weight of the total yield per acre is very much larger than when the roots are separated to greater distances. These facts are amply illustrated in the results of the experiments of various workers in the sugar-growing districts of France.

"The following table shows the averages of the results obtained from the experiments made by the *Societe d'Agriculture de Compiegne* in concert with the *Comite*

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*Guide Pratique du Fabricant de Sucre, p. 387.

*des Fabricants de Sucre de l'Oise.* This recapitulation is made simply according to the separation, and without regard to the fertilizers employed:

| *Distance between the beets in the rows.** | *Tons of beets per acre* | *Average weight of a beet, lbs* | *Density of pure juice, degrees* | PER HUNDRED OF JUICE. | | | *Deg ee of purity* | *Saline coefficient* | *Pounds of sugar per acre* |
|---|---|---|---|---|---|---|---|---|---|
| | | | | *Sugar* | *Salts* | *Organic matters* | | | |
| Ten inches | 32.533 | 1.88 | 6.79 | 14.55 | 1.0823 | 2.0910 | 81.93 | 13.58 | 8,473 |
| Fourteen inches | 29.515 | 2.23 | 6.06 | 12.68 | 0.8195 | 2.2976 | 80.19 | 15.61 | 7,480 |
| Eighteen inches | 31.048 | 2.85 | 5.05 | 12.40 | 0.8700 | 1.0142 | 86.71 | 14.43 | 6,691 |

*Distance between the rows, 18 inches.

"Pagnoul's experiments, conducted during a series of eight years, gave similar results. He concludes that close planting gives beets which are: 1, richer; 2, better quality; 3, of larger yield in weight; 4, less exhausting to the soil. He took, for his wider separation, 20 inches between the rows and 20 inches between the roots in the rows, and for the smaller separation 17 inches between the rows and 8 inches in the rows.

"1. The richness of sugar in percentages of the weight of root was:

| | |
|---|---|
| For the large distances | 10.2 |
| For the smaller distances | 12.2 |

"2. The proportion of alkaline salts, giving at the same time the measure of the foreign organic matters, was for 100 of beet:

| | |
|---|---|
| With large distances | 1.512 |
| With small distances | 0.722 |

"3. With large distances there were 16,326 roots per acre, and with the small distances 46,122, or nearly triple. The yield in weight per acre was:

| | *Tons.* |
|---|---|
| With large distances | 28.035 |
| With small distances | 36.045 |

"4. The quantity of salts removed per acre would be equal in round numbers to:

| | *Pounds.* |
|---|---|
| With large distances | 840 |
| With small distances | 520 |

"M. Pagnoul says, in conclusion:

"'Beets at small distances, while producing more of sugar, absorb less of saline matters.

"'Now we know that the constituent principles of sugar are entirely furnished by the atmosphere, and that the saline matters are furnished by the soil and by fertilizers; therefore, *beets at small distances from each other* (*i. e.*, closely planted) *are less exhausting to the soil.*

"'Close culture is more profitable at the same time to the grower and the manufacturer.'

"Dubrunfant says:*

"'The multiplication of subjects to avoid large roots, and to facilitate at the same time the production of a good constitution of the cellular tissue, is another condition to which great importance should be attached in the interest of richness in sugar.'

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*La Sucrerie Indigene, xiii, 460.

"Briem says* 'the separation of the roots should be 15 by 10 inches.'

"In a late discussion in the meeting of the *Cercle Agricole du Pas-de-Calais*† it was developed that though the distance of 17 inches between the rows was still in use, it is gradually giving way to the wider separation of 20 inches, on account of the difficulties experienced in horse-hoeing and the deficient aeration of the improved races of beets with strong foliage, which require more room.

"At the same time that the wider distance between the rows is adopted, the roots are left closer to each other in the row, about 8 inches; that is, to confine them to from 7 to 9 roots to the square yard of surface.

"The experiments of M. Pagnoul, and results he obtained, together with the other facts and figures given, will be sufficient to show the importance of this matter of close planting, without quoting the results of the same character obtained by Corenwinder, Ladureau, Mariage, Pellet, Deherain, Vilmorin, and others; and we may conclude that for the methods of culture that must be employed in the United States, where hand labor cannot be obtained, the wider distance between the rows, 20 inches, should be adopted, separating the roots not more than 8 inches in the rows.

"The cultural manipulations proper of the crop should begin as soon as the beets are up and the leaves sufficiently developed to distinguish the rows; and we may accept the statement so universally reiterated by those who speak and those who write on the subject, as supported by the success of the practice, that 'early and frequent cultivation cannot be too strongly recommended; it kills weeds scarcely started and forms a stratum of mellow earth which constitutes an obstacle to dryness by day, and assimilates the moisture of the night.'

"As before stated, as soon as the rows are defined by the development of leaves the first cultivation by hoeing begins.

"In France this is in many sections performed by hand, while in others it is effected by means of the horse cultivator, the object being, of course, the destruction of weeds and stirring up the soil. At this time, also, many growers make an application of nitrate of soda or potash. Two weeks later the beets are thinned out so as to leave the roots about 8 inches apart from centre to centre, after the manner described above. After this the crop receives about three hoeings or cultivations, and more than this if time allows, for the work should be discontinued about the 1st of July, according to some authorities, or may be continued as long as the leaves will allow, according to others. The latter will probably be for all localities and climates the better indication.

"After the final hoeing, about the 1st of July, no other care is necessary, with the exception of the removal of seed-stalks that may occasionally appear, especially if July and August be dry, until the harvesting, which should take place before the appearance of hard frosts. If the roots be frosted in the ground, they are rendered unfit for storing and preservation in caves or trenches for extraction of the sugar in the late winter, which is of course often necessary.

"Harvesting is generally begun about the middle of September, and may, according to the condition of maturity of the crop, continue until the middle of October."

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*Journal des Fabricants de Sucre, October 23, 1878.

†Journal des Fabricants de Sucre, June 4, 1879.

It is not unlikely that with us the beet-growing season will extend much later. Immature beets were analyzed this year that were harvested in November. As is the case with many other points, we must look to the experience of future seasons to determining the best time for harvesting.

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AN ACT to provide for the encouragement of the manufacture of sugar and paying a bounty therefor.

*Be it enacted by the Legislature of the State of Nebraska:*

SECTION 1. That there shall be paid out of the state treasury to any corporation, firm, or person engaged in the manufacture of sugar in this state from beets, sorghum, or other sugar-yielding canes or plants grown in Nebraska, a bounty of one cent per pound upon each and every pound of sugar so manufactured under the conditions and restrictions of this act.

SEC. 2. No bounty shall be paid upon sugar not containing at least ninety (90) per cent of crystallized sugar. The quantity and quality of sugar upon which bounty is claimed shall be determined by the secretary of the state, with whom all claimants shall, from time to time, file verified statements showing the quantity and quality of sugar manufactured by them, and upon which such bounty is claimed. The said secretary shall, without unnecessary delay, visit, or cause to be visited by such person as he shall designate in writing, the factory where said sugar has been produced or manufactured, and take such evidence by the sworn testimony of the officers or employes of such factory, or others, as to the amount and quality so manufactured, as to him, or the person so designated by him, shall appear satisfactory and conclusive. The sugar so manufactured shall be placed by the manufacturer in original packages, which shall be examined and branded by the said secretary, or person by him designated, with a suitable brand showing the quantity and quality of sugar contained in each of said several packages, of which an accurate account shall be kept by said inspector and filed in the office of the secretary of state.

SEC. 3. It shall be the duty of the secretary of the state to appoint a resident inspector in each town where one or more manufactories of sugar may be located in this state, the aggregate output of which factories shall exceed two thousand (2,000) pounds of sugar per day, and such examiner shall make such examinations, take such evidence, and make such records and reports as is specified in section two (2) of this act. The compensation or fee for such services of said resident inspector shall not exceed the sum of twenty-five (25) cents per package for each package so branded, nor the sum of five dollars ($5) per day for any one day's service, and such resident inspector shall be required to give a good and sufficient bond in the sum of not less than two thousand dollars ($2,000) to the state of Nebraska, contingent on the faithful performance of his duties, said bond to be approved by the said secretary of the state. Said fees or compensation, together with the cost of said brand, and any and all analyses that the said secretary of the state or authorized inspectors shall require to be made, shall be borne and paid by the claimant for said bounty.

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SEC. 4. When any claim arising under this act is filed, verified and approved by the secretary of the state, as herein provided, he shall certify the same to the auditor of state, who shall draw a warrant upon the state treasurer for the amount due thereon, payable to the party or parties to whom said sum or sums are due: *Provided*, That no bounty as herein provided shall be paid before the first day of January, 1890.

Approved March 19, 1889.

## APPENDIX.

1. We earnestly request the co-operation of all persons in the state that are interested in the sugar beet industry, in the further study of the conditions necessary to success.

2. A limited amount of seed is at our disposal, which will be distributed upon application.

3. During the coming season we will analyze free of expense any beets sent us, if accompanied by definite answers to the questions in circular, page 304.

### DIRECTIONS FOR SENDING BEETS.

I. Select half a dozen beets of each variety planted; two of the largest; two of medium or average size; and two of the smallest size.

II. Take beets from the ground without losing the leaves or breaking the tap root.

III. Wrap each beet separately, without removing leaves, in strong manilla paper.

IV. Put the beets of each variety in a package by themselves, enclosing with them the name of the variety, and send by express to H. H. Nicholson, Chemical Laboratory, State University, Lincoln.

V. Forward information in regard to growing of beets, soil, season, etc., in a letter addressed as above.

# GEOLOGY IN ITS RELATIONS TO AGRICULTURE.

[A paper prepared by PROF. LEWIS E. HICKS, Director of the Agricultural Experiment Station of Nebraska, for the Winter meeting (January, 1890) of the State Board of Agriculture.]

Agriculture is the oldest and most honorable human industry. It is when men begin to cultivate the soil that they emerge from barbarism to civilization. The first attempts at agriculture are crude and bungling. Only the rudest tools are known, and the husbandman is handicapped by superstition. He has more regard for the influences of the moon and stars than for the intelligent regulation and improvement of his own efforts. It is only when science has come to his aid that improved tools and improved methods are devised, and superstition is banished. The progress of agriculture is strictly in proportion to the application of scientific principles in the construction of farm implements, in the preparation of the soil, and in the ascertaining and utilizing the properties and characteristics of plants and animals. The farmer has to deal with each of the three kingdoms of nature—minerals, plants, and animals. Even the primitive farmer had to deal with all of these, and he was accordingly something of a geologist when he picked out a hard flat stone and shaped it into a hoe, and then selected for planting a level tract of land free from stones, with a tillable soil. He was something of a botanist when he selected those plants with edible seeds or tender roots which have been developed by cultivation into our domesticated plants of the field and garden. He was something of a zoologist when he selected and tamed the horse, the ox, the goat, the sheep, the pig, and the fowl, and made them serve him and feed him with their milk, eggs, and flesh. Science has been the handmaid of agriculture from the very first, but when agriculture was primitive, science was also primitive, and could give little aid. Now that the sciences have grown strong, have they parted company with agriculture? By no means. If the primitive farmer was something of a scientist in his crude operations, much more is the intelligent farmer of to-day a scientist if he can successfully conduct all those refined and complicated operations which are involved in the best modern farming; and by so much the more is the best science of the age under obligation to serve agriculture as it is now better fitted to render effective service than it was in its infancy. He who serves agriculture serves mankind, for agriculture is the foundation of all prosperity. To draw from the earth a perpetual succession of bountiful harvests is the essential condition of human comfort and happiness. As the earth is the instrument or medium of food-supply we must therefore study and understand the earth. But he who studies the earth in the most comprehensive manner is the geologist. Geology is the fundamental science in its relations to agriculture. A geological survey properly includes a complete description of the rocks, the soils, the plants, the animals, the waters, the topography, and the climate of the region surveyed. All these things go to form the aggregate of physical conditions upon which the success of agriculture depends. The soil is made up of decomposed rocks. The investigation and classification of soils therefore falls to the geologist, aided by the chemist. Soils are studied by the geologist with reference to their origin, their relations to the rocks beneath, and their physical condition; they are studied by the chemist with reference to their ultimate composition, and their capacity to furnish plant-food in an available form. Natural waters are studied by the geologist with reference to those general climatic conditions which determine their amount, the gauging of streams, the determination of the gradient of each stream, the topography of the adjacent surface, and other conditions which influence the problem of the economic use of the water for power or for irrigation; they are studied by the chemist with reference to their purity, and the amount and nature of the foreign matter held in solution by them.

The study of soils and natural waters, the two elements without which no crop can be produced, affords to the geologist problems of surpassing interest in every part of the country; but in no state are these problems of greater interest, or greater importance and value to agriculture in the results to be obtained by such study, than in this state of Nebraska. The soils and water supply of Nebraska possess features of unusual interest. We have soils of every grade, from the richest in the world to those which are at present worthless, but may, in almost every case, be redeemed by proper treatment. The water supply, in a state extending from the humid region across the sub-humid, and even into the arid region, is a vital problem, and every year this problem assumes greater importance as settlements extend westward, and the possibilities of ecomonic application of the waters now flowing on the surface, or of waters to be obtained by digging, boring, or impounding the storm-waters, become more manifest. A few considerations tending to establish the proposition that geology has important relations to agriculture in respect to the investigation of soils and waters, will constitute the body of this paper.

## I.—THE SOILS OF NEBRASKA.

The soil upon which the farmer depends for the success of his labors is a thin stratum spread over the surface of the earth, varying from a few inches to two or three feet in thickness, and composed of two elements, *humus* and mineral matter. The first element is organic, derived chiefly from plants but partly from animals, and has undergone partial decay. It is the essential element of fertility. But notwithstanding its prime importance it is, in point of origin, secondary and dependent upon the mineral matter. This possessed some degree of fertility in itself, and so produced a crop of plants whose decay enriched the place of their growth, and began that course of production and accumulation of *humus* which has resulted in the elaboration of the deep black soils which rejoice the heart of the Nebraska farmer. The mineral element of our soils varies greatly in composition, and these variations bring to view at once the relation of soils to the underlying rocks. It might be supposed that so thin and superficial a stratum as the soil, a stratum, too, which derives its most characteristic element from organisms growing freely in the air, would be independent of the rocks beneath. The bed rocks are often buried deep under many feet of clays, sands, and gravels, so that their relation to the soil seems to be extremely remote. But these clays, sands, and gravels, which constitute the subsoil, are derived from the bed rocks, either those of the immediate vicinity, or the bed rocks of some region not very remote. All the mineral matter of soils and subsoils is derived from the bed rocks by decomposition and disintegration. I have already shown that the *humus* is dependent upon the mineral mater. Hence the whole mass of the soil, with all of its constituent elements, is derived from the rocks. If all the loose material above the bed rocks were scraped off from the state of Nebraska, not many centuries would elapse until a new soil would be formed. If then we wish to understand the nature and origin of our soils, we must study the bed rocks. To facilitate this investigation I present herewith a preliminary geological map of Nebraska upon which the geological distribution of the bed rocks is represented. This map has cost me much labor in the field, but I do not claim for it anything more than approximate accuracy. It is such a map as a geologist would construct to illustrate a preliminary reconnoissance, not such as would accompany the final report of a geological survey.

By reference to this map you will see that the oldest formation in the state is in the southeast. Underlying the counties of Richardson, Pawnee, Johnson, Nemaha, Otoe, and Cass, and parts of Lancaster, Sarpy, and Douglas, the bed rocks are limestones, shales, and sandstones, with a few thin seams of coal. These rocks belong to the series of Coal Measures of the Carbonic system. The coal in them is too thin and poor in quality to be of much commercial importance; still it is mined for local use in several counties. About 1,300 tons were taken out in 1887. Of the three kinds of rocks in the coal measures the sandstone is least important, both as to quantity, value as a building stone, and effect upon the soil. A few thick layers of it occur along the Missouri river, but it plays no important part in the industries or wealth of the counties underlaid by the Coal Measures. The shales are more abundant than either the limestones or the sandstones, constituting more than half of the entire thickness of the Coal Measures. They are of no value except as the basis of soils and of brick and fire clays. The clays produced by the decomposition of these shales are often of superior quality.* As the basis of soils these Coal Measure shales are good or bad according to the other elements mixed with them. Shales alone will weather down to a soil which is heavy and difficult to till. But if mixed sufficiently with sand and lime a rich loam will be the result. The shales of the Coal Measures are often calcareous enough to furnish the lime necessary for a good soil, and if not the presence of limestones in the same formation yields a happy combination. The sandy element, which is needed to combine with the disintegrated shales in order to make a light, tillable soil, is furnished by the glacial drift and loess, two formations which lie upon the bed rocks in eastern Nebraska, and which will be described in the proper place.

The limestones of the Coal Measures are the most important of the series in point of their economic value for lime and building stone, as well as their influence on the soil. The decay of limestones always tends to enrich the soil—a fact so obvious as to challange the attention of the most careless observer. Limestones weather and decay more rapidly than is generally supposed. The carbonic acid of the air and water attacks the them with great vigor. Frosts crack their surfaces and the roots of plants enter and enlarge the fissures by their growth. Little by little the rock is broken down or dissolved, yielding its nutritive elements to the soil.

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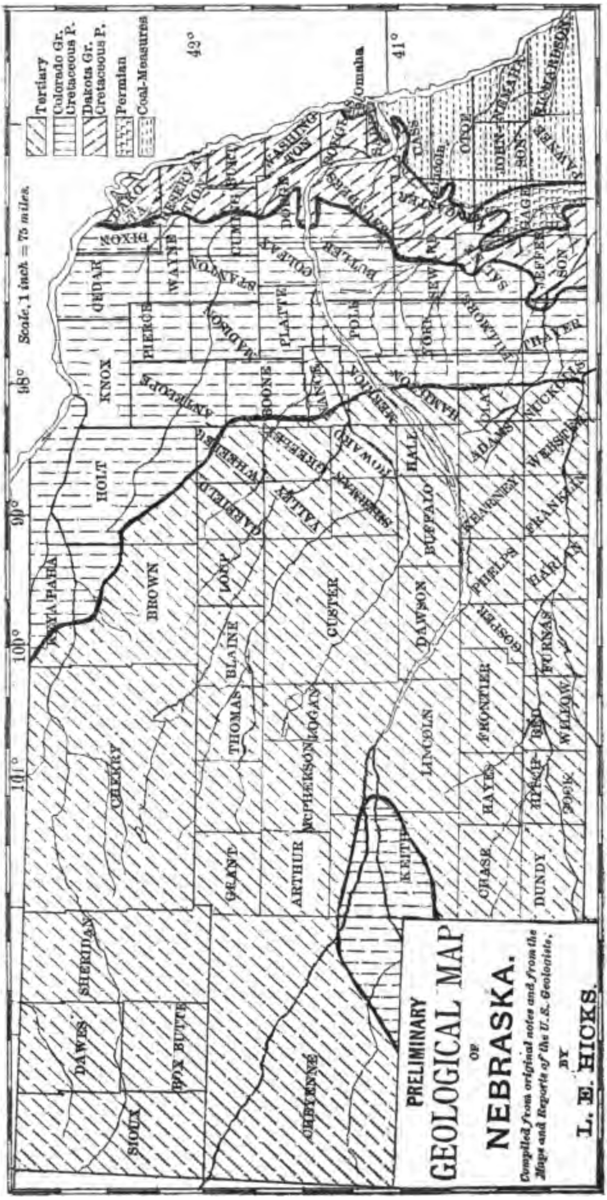
* These clays are now extensively quarried at Table Rock for use in Lincoln and Beatrice Equally good clays may be obtained in many other localities on the Coal Measures.


PRELIMINARY
GEOLOGICAL MAP
OF
NEBRASKA.
Compiled from original notes and from the Maps and Reports of the U.S. Geologists.
BY
L. E. HICKS.
Tertiary
Colorado Gr. Cretaceous P.
Dakota Gr. Cretaceous P.
Permian
Coal-Measures
Scale, 1 inch = 75 miles.
42°
41°
98°
99°
100°
101°
Omaha
DAKOTA
RESERVATION
DIXON
CEDAR
KNOX
HOLT
KEYA PAHA
BROWN
CHERRY
SHERIDAN
DAWES
SIOUX
BOX BUTTE
CHEYENNE
WAYNE
PIERCE
ANTELOPE
MADISON
STANTON
CUMING
BURT
WASHINGTON
DODGE
COLFAX
PLATTE
BOONE
NANCE
GREELEY
WHEELER
GARFIELD
VALLEY
LOUP
BLAINE
THOMAS
LOGAN
McPHERSON
ARTHUR
GRANT
CUSTER
SHERMAN
HOWARD
MERRICK
POLK
BUTLER
SAUNDERS
DOUGLAS
SARPY
CASS
OTOE
NEMAHA
JOHNSON
RICHARDSON
PAWNEE
GAGE
JEFFERSON
SALINE
LANCASTER
SEWARD
YORK
FILLMORE
THAYER
NUCKOLLS
CLAY
HAMILTON
HALL
ADAMS
WEBSTER
KEARNEY
FRANKLIN
BUFFALO
DAWSON
PHELPS
HARLAN
GOSPER
FURNAS
FRONTIER
RED WILLOW
HITCHCOCK
HAYES
LINCOLN
KEITH
CHASE
DUNDY

I have stated that the oldest rocks in Nebraska are in the southeastern corner. Going westward from the Missouri river one constantly encounters newer rocks lapping over on the older ones. Passing from Pawnee to Gage county we pass from the Coal Measures to the Permian, the last series of the Carbonic system. The rocks of this series are very similar to those of the Coal Measures, the distinction between the two being based upon a difference in the fossils and the absence of coal. Hence in the area underlaid by Permian rocks the same soils may be found (so far as they depend upon the subjacent rocks) as in the counties where the rocks belong to the Coal Measures. The Permian occupies about two-thirds of Gage county and small portions of Saline and Lancaster counties.

After the Permian epoch there was a long interval during which no rock forming sediments were deposited in the region now known as Nebraska. During the Carbonic period the sea prevailed over this region and in it were deposited the mud, sand, and lime which have hardened into the shales, sandstones, and limestones of the Coal Measures and Permian. Then the sea retired, and during the Triassic and Jurassic periods, while thick strata were formed in other parts of the continent, Nebraska was dry land. The streams of water upon its surface cut deep valleys during this interval. Then as the land slowly sank again, the sea once more invaded this region. In the valleys formed by running water, which were approximately in the same lines with the valleys now in existence, the incoming sea formed deep bays along its eastern shore. In these bays and all over the region covered by the incoming sea, was deposited a series of sands, clays, shaly sandstones, hard sandstones, quartzite, lignite, conglomerate, and shale, which now form the Dakota group of the Cretacic system. This is found in Dakota, Burt, Cuming, Dodge, Washington, Douglas, Sarpy, Saunders, Lancaster, Seward, Saline, Jefferson, and Gage counties, as the reader will see by reference to the map. Some of these counties are almost wholly occupied by the Dakota group, others are just touched by this formation.

Of the various kinds of rock above mentioned as occurring in the Dakota group, the sands, sandstones, and clays are most abundant, and exert the greatest influence upon the soil. The clays are valuable for brick and pottery. Where they form continuous strata of considerable extent, with a level surface, the water is retained, causing boggy or swamp land. By themselves these clays impart too great heaviness and tenacity to the soil, but with a suitable proportion of sand intermixed a good loam is formed. An abundance of sand and sandstone is everywhere present in the Dakota group to temper the clays. In some places the sandstone predominates so much as to form sandy knolls with a thin and poor soil or none at all. But these bald knobs are not numerous, and are never of great extent. The glacial drift and loess cover the country occupied by the Dakota group so generally that it is only on the high points projecting into the valleys that the sandstone foundation is in sight, making thin land.

West of the Dakota group comes the Colorado group of the Cretacic system, extending through the east central portions of the state. Its eastern boundary is the Dakota group as already indicated. Its western boundary runs from the northwest corner of Brown county in a southeasterly direction to Boone county, thence almost due south to the Kansas line, near the point in Nuckolls county where the Republican river leaves Nebraska. Besides this great central belt of the Colorado group there is another area in Cheyenne, Keith, Lincoln, and Perkins counties.

along Lodge Pole creek and the South and North Platte. The rocks of the Colorado group are limestones, shales, and clays, which exert the same influences upon the soil as already ascribed to such rocks occurring in the Carbonic system. A characteristic difference, however, between the Carbonic limestones and those of Colorado group is that the latter are extremely soft and friable, thus the more readily breaking up and yielding their nutritive elements to the soil. So well marked and general is this characteristic that these strata of the Colorado group are generally known as "rotten limestones." They are full of shells of the genera *Inoceramus* and *Ostrea.* Some of the outcrops look like dumping grounds of an oyster market, as if the shells had been thrown down by the wagon load and partially cemented together by the solution and redeposition of the calcareous matter. This process of solution and redeposition has in some places produced large masses of crystals of calcite. In northern Nebraska the limestone of the Colorado group is quite chalky, so that it is known as "chalk rock." Fine sections of it may be seen in the hills bordering the Missouri river in Cedar and Knox counties. In western Nebraska the limestone of the Colorado group is firmer in texture than in the central belt, but still readily yielding to the action of the elements, and thus enriching the soil.

The Cretacic rocks both of the Colorado and Dakota groups were deposited in seawater. Marine fossils occur in them from top to bottom. After the close of the Cretacic period much of Nebraska was dry land, but a fresh water lake covered all the western and central counties. In this lake, which varied in its extent from time to time, were deposited the rocks of the Tertiary era, the most widely distributed of all the geological formations of Nebraska. It is indicated on the map by oblique strokes from the right above to the left below. The rocks of the Tertiary include nearly all the kinds previously mentioned. Limestone of the ordinary kind, rotten limestone, ordinary sandstone and calcareous sandstone, indurated clays, and soft clays, conglomerate, lignite, and quartzite, are all found in the Tertiary. Loose sands also occur in great abundance, and as they are driven to and fro by the wind form the belts of "sand hills" which mar the beauty and productiveness of many townships. Marl of fine quality for fertilizing, and beds of peat, are also found in the Tertiary.

The so-called "bad lands," or *mauvaises terres*, of the Tertiary are formed by erosion in the indurated clays and marls which yield to running water readily enough to form deep gullies in the line of the current, and yet have the requisite firmness and tenacity to stand up in steep walls against the weather. These bad lands constitute a temporary stage of the evolution of stable land surfaces in soft strata. So long as the little streamlets have a rapid fall they gouge out deep gullies with steep walls. Each side channel entering the little valley forms a tributary canon, which again forms its tributaries, until an intricate maze of principal and tributary canons is produced. In the process of formation, while erosion is in rapid progress, no vegetation can obtain a permanent hold in any of the gullies. But as the system enlarges and the tributary canons run into each other, the central stem of the tree-like system widens out and ceases to become deeper because the natural drainage level has been reached. Grasses, weeds, shrubs, and trees take root. The steep walls are washed down to gentle slopes which presently take on the grateful green of the valley. Thus the whole region which the water had cut into barren, forbidding, and impassible gullies, may be transformed into fertile valleys. The process is too slow, however, to make it advisable to locate claims in the bad lands. Like all geological processes, it requires ages to work these changes. The whole continent is gradually approximating a condition of stability as regards erosion, but that condition will not be reached until the whole surface is reduced much nearer to the level of the sea than it is at present.

The bad lands and sand hills, however, form but a small part of the country occupied by the Tertiary. Some of the best grazing and arable land in Nebraska may be found in the bed of the old Tertiary lake, and it owes its fertility directly to the sediments deposited there. Much of that sediment is indistinguishable from the loess of eastern Nebraska, one of the best foundations in the world for a fertile soil, as shown more fully below. Both are fresh water formations, much resembling the dried mud of existing lakes and rivers, whose fertilizing qualities are exemplified in bottom lands, in the beds of lakes reclaimed by drainage, and in the effects of the overflowing waters of the Nile upon the lands of Egypt.

This completes the enumeration of the bed rocks of Nebraska, as they are delineated upon the acconpanying map. There are nine additional formations not shown on the map, but mentioned in this paper because of their direct influence upon the soil, or because some of them may hereafter assume considerable importance as fertilizers. These are Glacial drift, loess, adobe, residual earth, alluvium, muck, peat, marl, and the forest bed. They are not shown upon the map because their extent in Nebraska is not thoroughly known, and they overspread the bed rocks so generally that if they were represented the underlying formations would be hidden.

The glacial drift is composed of sand, gravel and clay. It was carried down from the north or northeast, and spread over the eastern third of Nebraska by the agency of ice, and was in many places subsequently modified by the action of water. A considerable proportion of the drift came from remote ledges of granite and other hard and crystalline rocks which are entirely foreign to Nebraska. But a very large proportion of it is made up of fragments of the bed rocks in this state. Hence the influence of the drift upon the soil depends in some degree upon the local outcrops. Where it lies over beds of limestone, pebbles of limestone will be found in it, and it will, in such places, form calcareous soils. If, however, the ice of the glacial period advanced across the lines of outcrop of the different bed rocks, the fragments of each kind will be found to have been carried over upon the strip of country occupied by the next kind of rock. This dragging across the strike of the rocks may be observed in several places in Nebraska, but inasmuch as the rocks here are generally soft and easily crushed, they were speedily reduced to such fineness as to be unrecognizable, and this circumstance imposes a limit to the spreading of each kind over the territory of the next. The hard foreign boulders and pebbles withstood the crushing action the longest of all; the carboniferous limestones come next in their powers of resistance and consequent longevity as elements of the drift; some hard ferruginous lumps of Cretacic sandstone are as resistant as the limestone, but in general sandstones perish quickly in the grinding motion of the ice; last, and least resistant, are the rotten limestones and chalk rocks of the Colorado group. It should not be forgotten in the meantime that even after a rock is ground fine it exerts an influence upon the mass of which it forms a part, though it may no longer be possible to identify it and trace it back to the ledge from which it was torn away. Indeed when it is a question of influence upon soils, as in the present discussion, the finer a rock is ground up, the more directly and completely will it enter into the work of soil-building. Hence a soil formed from the drift may have a dash of everything which the ice has passed over in its long journey from the Canadian highlands, the nearest outcrops furnishing, however, the larger proportion.

This thorough mixing of the many diverse elements of the drift has, in general, a happy effect. The proportions of sand, gravel, clay, and lime are usually about right for a good subsoil, and the addition of organic matter builds up a fertile soil upon this porous and well drained substratum. In some cases the mixing and grinding of the drift has not gone far enough, and the result is a sterile "hard pan" which is extremely difficult to manage. In other cases the grinding has gone too far, and instead of mixing there has been a separation of the fine clay to form heavy beds of "gumbo." But with these two exceptions the soils derived from the glacial drift possess a high degree of productiveness, being loamy, easy to till, with good drainage, and not soon injured by drought.

Immediately upon the drift, and sometimes partly buried within it, we find in many counties of eastern Nebraska a stratum of black, or dark brown, earth which looks like an ancient land surface upon which a soil accumulated similar in its origin, its physical properties, and chemical composition to the soils covering the present surface. Inasmuch as this "forest bed" is covered under many feet of loess, and yet resembles the surface soil, its discovery always occasions surprise, and provokes speculation as to the cause of its mysterious presence in such a situation. Its appearance does not belie its origin. It is generally taken for a fossil, or buried soil, and there is no reason to doubt the accuracy of that supposition. It gives evidence of a stage of terrestrial evolution during which eastern Nebraska was free from both water and ice, and upon the land surface an ample crop of woody and herbaceous plants flourished, and, mingling their decaying fragments with the earth, formed this buried soil. Certainly this forest bed indicates emergence from the waters which once covered this region, but it is not so certain that the land was free from ice. Much low vegetation, and even considerable forests, are known to accumulate upon the marginal ice of glaciers, though this ice may be still in motion. The forest bed has a depth of seven feet on the farm belonging to the Agricultural Experiment Station of Nebraska near Lincoln, and it possesses a depth equal to that of the surface soil in many places. It is known that a soil of average depth requires a long period of time for its formation, hence the forest bed gives positive indication of a long period of rest during which the surface of eastern Nebraska was constantly above water and in that quiescent state which favored the growth and accumulation of much vegetable matter.

The economic interest attaching to the forest bed lies in the possibility of its use as a fertilizer. We are now engaged in making large drafts every year upon the rich surplus of plant food stored in our soils by decaying organic matter during long ages past. As yet the account has not been overdrawn because the balance in our favor was very large, but the day will come when we shall have to make new deposits, or else our drafts will be dishonored. In plain terms we shall have to use fertilizers if we wish to maintain the productiveness of our fields. The time will soon come in this state when every possible source of plant-food within our reach will be worthy of diligent search and faithful application. Where the forest bed has considerable thickness, and is not too deeply buried, it may prove useful as a fertilizer.

The same may be said of the beds of marl which occur in many counties. Marl is a calcareous earth, enriched with carbonaceous organic matter, and is usually formed in lakes or ponds, where the products of decaying vegetation are mingled with various kinds of shells. It occurs in several different geological formations. Its value as a fertilizer has been amply demonstrated, and, where the demands of an impoverished soil are not completely met by supplying marl alone, a mixture of it with muck, peat, or the forest bed, would prove advantageous.

Muck and peat are swamp deposits, very rich in organic matter, so rich, indeed, that a newly-drained swamp is not always fertile. This paradox is explained by the fact that a good soil must have "body" as well as richness in plant-food. Peaty soils are too light and chaffy to retain moisture and furnish the necessary mechanical support to growing plants. A mixture of clay and sand may be applied with advantage to such a soil, and, on the other hand, peat and muck form a good dressing for fields which lack organic matter or *humus*.

I have grouped together the forest bed, marl, muck, and peat, without regard to their chronological succession, because they all have some promise as fertilizers. I shall next group together three other formations because they are alike in the influence they exert upon the overlying soils. These are the Loess, Adobe, and Residual Earth.

Loess is a fine, silicious deposit, which would be designated clay by most persons, but it differs from clay in many and very important respects. Clay consists largely of aluminum, while loess contains but a small proportion of that element, and a very large proportion of silica. Corresponding to this difference of chemical composition are physical differences of great significance in relation to soils. Clay is highly adhesive, impervious to water, and "bakes" into clods of stony hardness when it is turned up by the plow. Loess is slightly adhesive, water penetrates it readily, and it never bakes into hard clods by exposure in a moist condition. The excellent natural roads of Nebraska do indeed testify to the fact that loess may form a very firm and hard surface, but this is the result of pressure rather than of baking. In its chemical composition the loess contains all the essential elements required in the growth of plants, in so far as that growth depends upon the mineral kingdom. Hence when the organic matter of the humus is added to loess (some organic matter being already contained in the loess itself) the happiest combination for a fertile soil is secured. The physical properties of the loess are of even greater importance than its chemical composition. It is permeable to moisture, and therefore insures good drainage to the soils formed and underlaid by it. At the same time, water does not run through it so rapidly or pass away so completely, as in sand or gravel. Every cubic foot of it retains a large amount of moisture, and, since it has a thickness of more than a hundred feet in many places, the aggregate amount of moisture retained by it is enormous. As the surface dries in the heat and drought of summer this retained moisture is brought up to nourish the growing crop. In the rainy season a fresh stock of moisture is laid up. This storage of moisture is much facilitated by the loosening of the surface in the operations of tillage. By the trampling of animals, the sun's heat, and the beating of storms, the natural surface of the prairie became hard and nearly impermeable, causing the rainfall to pass off in sudden floods. The breaking up of this hard stratum by cultivation causes the retention of a much larger percentage of the rainfall, and indirectly increases the rainfall itself.

As regards the origin of the loess, various theories have been proposed, but of these none as yet can be regarded as fully established, or entirely satisfactory. There seems to be no reason to doubt, however, that its formation was in some way related to the glaciation of this part of North America. The loess lies upon the the glacial drift, and occurs in all the counties occupied by the drift. It extends also into other counties west of the limits of drift, but how far west has not been ascertained. It seems probable that it is a product of certain abnormal conditions which prevailed during a long period succeeding the advance of the ice, when the ice-field was slowly retiring, and annually yielded copious floods of water by its melting. The streams were overloaded with sediment carried into them by the glaciers. Not only did they have more sand, gravel, clay, and boulders in their valleys than they could transport and rearrange, but these materials were dumped down by the ice in irregular heaps, causing obstructions to free drainage which occasioned the formation of numerous lakes and ponds over the general surface, and long reaches of backwater in the valleys. The still unmelted remnants of the ice constituted additional barriers.

The loess is not all of the same age. That portion of it which extends westward from the glaciated area was deposited while the ice was still advancing. Nebraska presents a sloping surface to the eastward, and as the ice advanced from the northeast across the Missouri river, the Platte, the Loup rivers, and the Niobrara were dammed up and in the extensive lake so formed loess, or fine silt, began to form. The western loess is therefore contemporaneous with the earliest portion of the glacial period. That loess which occupies the uplands throughout the glaciated area is manifestly later in its origin, since it lies above the drift, and must therefore have been deposited after the ice retired. The obstructed drainage, the flooded condition of the country produced by melting ice re-enforcing the annual rainfall, which I have described above, characterized the deposition of this upland loess over the glaciated area. The waters of the western lake in which the older loess was deposited followed after the retreating ice-front which formed its eastern shore, and added still another increment of moisture to swell the floods of this diluvian epoch. The natural outlet of these waters would be to the southeast, along the retreating ice-front, and in southern Nebraska distinct evidences yet remain of the strong currents thus produced, as well as of the discharge in the same direction of the older lake Cheyenne.

The valley loess of the glaciated area is still later than the upland loess. It was formed by the wash of the hills into ponded expansions of the rivers after they had, to a great extent, cleared their valleys of the glacial debris, and the drainage had been nearly re-established. It is therefore much later than the upland loess, and this in turn is considerably later than the western loess.

This division of the loess into three kinds distinguished by age is of greater interest to the geologist than to the farmer, inasmuch as the physical properties, and consequently the influence on the soil, are identical in all three. Adobe is another formation which also constitutes a superior subsoil, and is so much like the loess that many writers still decline to make any distinction even in the name. It differs however in origin. Instead of being a lake-sediment it was formed on a land surface. It is the finer portion of the wash from the mountains. Every storm of rain brings down great quantities of matter from the mountains, composed of huge rocks, boulders, gravel, sand, clay, and fine earth. The large rocks are dumped at the foot of the steeper slopes; the boulders and gravel are spread out in conical heaps at the mouths of the valleys; the sand is swept along by the waters to a considerable distance; and the fine earth and clay are carried far out on the plains and deposited in beds which constitute the adobe. The name is derived from the circumstance that in Mexico, and in the adjacent provinces of the United States, sun-dried bricks are manufactured from this formation.

Some beds of adobe undoubtedly occur in western Nebraska. It fills the place there, as a substratum for soils, which is occupied by the loess in central and eastern Nebraska, and imparts the same excellent qualities.

Still another formation is present in this state which closely resembles the loess in composition and properties, but it is so different in origin from either loess or adobe, that it deserves a separate name; and the name bestowed upon it by geologists is residual earth. It is so named because it is what remains of rocks which are undergoing disintegration and decomposition in the place where they lie. Frost, rain, organic acids, mineral acids, alkalies, plants and animals are constantly attacking the exposed rocks. These combined attacks give real meaning to that figurative expression, "the tooth of Time," whose continuous gnawing produces notable results in the course of centuries. These agencies of disintegration are more active in some climates than in others. Cleopatra's needle has suffered more damage in a few years in New York than it suffered during many centuries in Egypt. But sooner or later all climates find the flaws in the rocks and begin the process of destruction. The fragments broken off are broken again, and again, till they are reduced to impalpable fineness. The residual earths are, indeed, the finest of all geological products. The loess has long been noted for its fineness, which is certainly remarkable, but the residual earths are still finer. Chamberlin and Saulsberry* found that 99.9 per cent of the residual particles of earth were less than .005$^{mm}$ in diameter, while only 97.3 per cent of loess particles reached the same degree of fineness. Either of these substances is very fine, however. It would take more than 200 particles of residual earth, laid side by side, to make a line as long as the thickness of a man's thumb nail.

The rocks of Nebraska being mostly all soft and readily disintegrated, the amount of residual earth formed by their decay is large. It does not, however, play so important a role in the formation of soils as in some other countries, for two reasons. In the first place the bed rocks of eastern Nebraska are quite generally covered with glacial drift and loess, and these superficial deposits protect them from those agencies which are most active in forming residual earth; in the second place the rocks of central and western Nebraska not so covered are comparatively new rocks. Residual earth forms very slowly. The quantity of it which may be present in a given region depends largely upon the length of time since that region was exposed as a land surface, though the kind of climate has also much to do with it, as stated above. In the southern states of the Union, where a warm and moist climate promotes rapid disintegration, and where the element of time has also had ample scope, the rocks being Archæic and Palæozotic, the decay has proceeded to the depth of one hundred or two hundred feet. Notwithstanding the softness of Nebraska rocks the decay has not extended nearly so deep. Still it has been considerable, and the earth so formed is a valuable element of our soils. It is not only the bed rocks which decay and form residual earth, but the various elements of the drift are attacked in the same manner by the same forces, and yield all the more readily because they are already in a fragmentary condition. The residual earth so formed, equally with that derived from rocks in place, constitutes an admirable substructure of finely divided mineral matter upon which to erect a fertile soil by the addition of organic matter in some stage of decay.

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*Report on Driftless Area of Wisconsin, in Sixth Annual Report, U. S. Geological Survey, p. 279.

Alluvium is the sediment of rivers deposited in bottom lands. It differs from residual earth in the fact of having undergone transportation in water. In this particular, and also in being laid down upon a land surface, it agrees with adobe; but it is more heterogeneous and complex than adobe, being derived from all the rocks in the upper course of the stream, and it contains much more organic matter. The excellence of the soils in bottom lands is too well known to require any comment.

### RECAPITULATION OF PLEISTOCENE DEPOSITS.

Glacial drift is the material transported by ice during the glacial period, and is composed of boulders, gravel, sand and clay. It is distributed over nearly one-third of Nebraska (the eastern third) and forms a fairly good soil and subsoil. It sometimes runs into hard-pan or gumbo, as explained above.

Muck, peat, marl, and the forest bed are grouped together as all having prospective value as fertilizers. Muck and peat are formed in wet places by the accumulation and partial decay of vegetation. Marl is a limy substance, enriched with carbonaceous organic matter, formed in lakes or ponds where the decaying vegetation is mingled with various kinds of shells. The forest bed is an ancient soil formed during a certain phase of the glacial period when the ice retreated long enough to permit the accumulation of organic matter upon a land surface, which was then buried under later deposits.

Loess, adobe, and residual earth are grouped together, because they are substantially alike in their influence upon the soil. Loess is a product of the diluvian stage of the glacial period when the superabundance of waters produced by melting ice and annual rainfall, together with obstructions to the drainage, occasioned great floods in the valleys and numerous lakes and ponds over the general surface of the land. The western loesss which extends beyond the area of the drift is the oldest, having begun to form while the ice was still advancing; the upland loess of the glacial area is next in age, and the valley loess of the same area is newest of all. Adobe is the finer portion of the wash from the mountains, and residual earth is the product of the decay of rocks in place. These two formations, equally with the loess, invariably form a superior subsoil, being porous enough for drainage, and yet compact enough to retain moisture for the sustenance of vegetation in times of drought.

Alluvium is the fine silt thrown down by rivers upon their flood plains. It is still in process of formation. Its effect upon the soil has only one drawback, viz.: that the flood waters which carry it upon the fields, and thus fertilize them, at the same time render them unfit for many kinds of crops. The second bottoms which have already received a full supply of alluvium but are no longer subject to overflow, are free from this objection, and show the excellence of alluvial soils in a very high degree.

## II.—The Waters of Nebraska.

An adequate discussion of the waters of Nebraska would make this paper too long, if it has not already exceeded the proper limits. The reader is referred to my bulletin on Irrigation (Bulletin No. 1, of the Agricultural Experiment Station of Nebraska). I shall hereafter treat the subject more fully than I have in that bulletin, as its importance becomes more obvious from year to year. Our own people were at first indifferent, but they have at last begun to realize that the water is worth as much as the land. We have reliable assurances that Nebraska will hereafter obtain a fair proportion of the funds appropriated by Congress for irrigation surveys. This is largely due to the favorable report of the Senate Committee on Irrigation, which would have passed by Nebraska without notice but for my efforts to procure a session of the committee in this state, which were fortunately successful. The committee met at Ogalalla and took testimony as to the need of irrigation in western Nebraska. My previous study of the subject enabled me to present the matter in its broader aspects, while the testimony of numerous citizens of that region supplied the local information necessary to enable the committee to form a correct judgment. The committee and Major J. W. Powell, director of the U. S. Geological Survey, who also attended the session, were unanimous in their opinion that Nebraska deserved recognition in the appropriations to be made hereafter, and it only remains for our people, and our delegation in Congress, to manifest a proper interest in the matter in order to secure all that properly belongs to this region.

The use of natural waters for power in milling and manufacturing is highly important also, and it concerns all parts of the state. A topographic survey would show how readily this source of wealth might be utilized to a much greater extent than at present.

A thoughtful review of the whole subject of soils and waters must convince any candid person that nature has been liberal in her gifts to this region, and that man has not yet utilized half of her bounty. Through all the long ages of geological history the surface of the earth has been in preparation for the dwelling place of man, and the physical conditions which now secure the growth of crops have been gradually evolved. It becomes clearly evident that the science of geology which traces out these processes has a very fundamental and direct relation to agriculture.

# FEEDING COWS.

BY SAMUEL LICHTY, FALLS CITY, NEB.

[Read at the annual convention of the Nebraska Dairymen's Association, 1889.]

I desire that the influence of this Association should at all times go forward, forcibly demanding better feed for dairy animals. I am well aware that professional dairymen need no urging in this matter, for they have heard, read, and experienced that nowhere does good feed pay better. A Nebraska farmer can be found here and there also who is not a professional dairyman that feeds his cows right. But from what I have seen by traveling over the country, I am persuaded that not more than one cow in a hundred is fed as she deserves to be, as she ought to be—or as farm horses are usually fed. The old rule is—that you can't take more out of the flour barrel than you put in. But we have thousands of farmers that are continually trying to disprove this truth by experiments with the cow. They insist she shall produce large quantities of rich milk ten months each year, but the food for this and for her sustenance she shall get as best she can. If she is found stealing an ear of corn from the crib, she is liable to have a bone broken as punishment. To feed her a peck of oats would be an outrage on the horses and colts. She is left in a summer pasture barely fit for cattle not in milk, and does not receive a pound of grain or other extra feed. Most of her time in winter and spring is spent in a desolate stalk field, so pastured down it would try a buffalo hard to live there, yet she is fed very sparingly then. This picture need not be enlarged.

Progressive, reading, thinking farmers, who take time to attend institutes and conventions, know full well that a part of our population is engaged in a life-long struggle, to see with how little food cattle can get along and not starve. They frequently pass the danger point, and some die for want of proper feed, but still the experiment continues. Such men come to your barn-yard and say, "What a large fleshy breed of cows you have, I must get some of this stock." No odds what improved breed such men get, they soon starve all the improvement out of them, and their herds look like thoroughbred scrubs. What unnumbered reports we hear each fall, how the cows died when turned into stalk fields. Yes, the poor, gentle cow must bloat, and suffer and die. Now why is it that you never hear that a dairyman bloats and dies when he breaks into a cornfield. You all break away from home duties once a year to attend this convention. Then you seek the very best hotels, where perhaps are found numerous dishes not eaten daily by all dairymen at home, expense and trouble are not spared to make these tables groan with all the market affords.

Figuratively speaking, this is the time of the year when Nebraska dairymen are turned into the cornfield; but you never heard, and never will hear, that the gorging proved fatal to any of them. And why not? Simply because they have been fairly fed previously. Their digestive organs have been used to fairly sized loads of ordinary food. Had you all at once eaten thus after a ten days' fast, it would have gone hard with you. Contrariwise, the gentle, lowing, coaxing cow is hardly ever fed cornmeal and other grain while on summer pasture. She is treated little better when drouth, or short fall pasture overtakes her. This causes suffering, and this suffering causes such a contraction and weakening of the digestive organs that death must frequently follow in November and December when they are turned into stalk fields and allowed liberty. I am not saying that proper feeding would save all that thus die, but I do believe a large majority could be saved by systematic feeding during the fall months.

You would have no fears whatever in turning a bunch of well-fed, fattening steers into a stalk field. The suffering endured by a poorly fed cow while giving milk must fit her organs to crave too much, then digest it poorly.

I disclaim all knowledge of what might be termed "scientific," as to weighing, testing, experimenting, etc., but I believe that while a cow gives milk she should generally be fed all the grass, grain, and hay she can endure without discomfort. I think this will do as a fair rule among general farmers. To feed less, I believe to be poor economy. The best cow is not the one that can give milk the longest, with general buffalo care. The best cow is one which produces the largest amount of milk, cream, butter, and cheese from a given quantity of food. Or, to state it differently, the best cow is the one that can each year turn the largest quantity of feed into dairy products.

Some farmers pamper their horses to discomfort, so as to attract attention on the road. Others try to see how much cream they can skim from their farms and ship through the elevators, as wheat, oats, and corn. While, at the same time, in many places the cows are sadly neglected, forced to forage for a living, and in the spring of the year they are not only a pitiful sight to see, but an actual disgrace to our profession.

I want to plead with the general farmer to feed his cows more liberally. I shall not charge a cent to warrant you against loss if you do so. Cows fed poorly during spring can't give rich milk when turned on pasture. When they get into good feed nature insists that first of all the waste of her body be repaired, and only the thin watery part of milk goes into the pail. 'Tis true that too much corn might make cows too fat, and injure the secretion of milk, but no milk giving cow should have less than a gallon of meal per day. She needs it to keep up her general system and animal heat. We can hardly feed them too many oats. Some need more and some less. The value of bran is well known, but some farmers object to buying any feed at all. So feed oats freely, give her at least half a bushel per day. Oats are easily raised in the west. The straw, well preserved, is as valuable as most hay. So, then, raise and feed largely of oats. What a pitiful howl the farmers of the west sent up last fall because their large oat crop was only bringing 15 cents per bushel. Yet there are enough hungry cows and young cattle right here to consume it all and return you at least twice 15 cents if fed and sheltered properly.

Our potato crop is so large the price is almost nothing. Touching cheap oats and cheap potatoes, I have an opinion which I can't prove by figures, but which I still firmly believe. I am of the opinion that cheap oats fed to good cows well sheltered will never return less then thirty cents per bushel in good butter, cheese, and sweet milk. Then by boiling, salting, mashing, and feeding cheap potatoes to good pigs, in connection with sweet milk, the potatoes will never bring less than thirty cents, and frequently much more. Nothing pays the farmer better than a number of chores well done. Those who attend to details are the ones that succeed in every line of human activity. It is not so much from a want of knowledge in this line as from a dislike for chores that hinders our progress. It is lamentable to see what a large number of farmers and farm hands despise the humble, old-fashioned work of milking cows and feeding calves. The same distemper is running against all hand work. The hoe and the truck patch are in disrepute. Too many want to do everything with machinery; they thresh by steam, the corn-sheller must load the corn into the wagon, the elevator must unload it with leverage and dump. That is the style of work this generation likes to do. Yet everywhere we find loud complaints of " hard times — Can't ever get a farm of my own —My debts and mortgage I never can pay," and so on. It is the duty of this Association to continue its missionary work in going from place to place all over the state, lure these fellows into your meetings, and plead with them to come down off their machines and assist in the better feeding and sheltering of animals, assist in the milking, the cleansing, the skimming, the churning, and calf feeding. You need not hesitate to assure them that their farms will soon become more fertile instead of poorer, and the times will get better with them.

In improving a farm the horse barn is generally built right after the house, and Germans are blamed for building the barn first. Excellent hog barns are beginning to dot the prairie farms everywhere.

But comfortable cow barns are still the exception. Many good serviceable dams with their tender young lie out doors on the cold, frozen earth all night; they have no place of retreat from cold, stinging winds; the chilly rain, and sleet, and snow saturate their entire bodies. While in milk their bodies are particularly tender and sensitive, so that such mistreatment gives them chills, and then fever; ending in untold misery to themselves and no profit to the owner. My brethren, these things ought not so to be. Our humane feelings, and what we know of physical nature in our own bodies, should prevent us from inflicting such torture. I beseech you that as long as you can remember this convention that you remember that its pleading and injunction was that the cows shall never go hungry nor unsheltered in bad weather. Stand faithfully by the cows on your farm and you will find that nothing will so faithfully stand by you, to help you on in a happy, healthful life, and to financial independence.

# GRASS.

BY GEO. A. ABBOTT, FALLS CITY, NEB.

[Read at the annual convention of the Nebraska Dairymen's Association, 1889.]

More than thirty years ago, when the white man made his first appearance upon the rich, billowy prairies of Richardson county he found a soil rich beyond conception in plant food, the result of countless ages of accumulation, a veritable "Nature's strong box" which had only to be unlocked with the plow to yield an abundance of golden harvests. Year after year, without any return to the soil, in the way of fertilizers, our farmers have continued to draw exhausting crops of the cereals from the ground, shipping them to the markets. This skimming process, together with the drifting winds of winter, and the washing rains of summer, has been continued, until today, measured by their productive capacity, our hill soils are worth but little more than half as much as they were thirty years ago. And while our farmers may point with pride to their palatial residences, magnificent barns, and respectable bank accounts as evidence of their success, they seem to forget the fact that these things are only the original wealth of the soil, metamorphosed into new shape and substance; that if they should strike a balance, taking into account the impoverished condition of their fields, they are but little better off than they were thirty years ago, when these splendid improvements were held locked in the unmortgaged bosom of the soil.

How, then, may we make a substantial growth and at the same time restore to our famished lands their original fertility? The answer is found in the one word — grass.

As illustrative of the advantages of grass farming over grain farming, permit me to cite one of the many instances that have come under my immediate observation:

About fifteen years ago one of my neighbors, blessed with sufficient foresight to penetrate the future and discern whither we were drifting, began sowing a major portion of his farm to grass and to gradually stock it up. While the hum of the thresher and sheller were heard at the farms of others, who, with long lines of teams, were carting away to a glutted corn and wheat market the cream of their soil, he, with his flocks and herds, was marching along a surer road to fortune. To-day he is the proud owner of two fine farms, three-fourths of which are kept constantly in grass, covered with several hundreds of thoroughbred sheep, together with large herds of fine horses, cattle, and hogs.

Result: He and the mortgage fiend have long since parted company, and the preserved fertility of his soil is evidenced in the superior abundance of its yield and the absence of foul and noxious weeds; besides all along the line of his life he is in the constant enjoyment of that peace of mind which can come to the husbandman only from the contemplation of grassy fields, lowing herds and bleating flocks, and the knowledge of the fact that the wolf is far removed from his door.

One other instance I hope I may be permitted to cite without subjecting myself to the charge of egotism.

For a long time I did what a great many others did and are still doing. I followed the more exhaustless system of grain farming with its resultant concomitant, interest paying; but "whom the Lord loveth He chasteneth," and in 1883 there came a great flood down the valley on which my farm (which consists chiefly of bottom land) is situated, overflowing and drowning out a large percentage of my crops. I then concluded to put into practice a plan which I had for some time been contemplating, that of starting a horse ranch; so the following fall I sowed twelve acres to timothy, having previously sown my timber land to Kentucky blue grass, and the following spring I sowed twenty acres more in timothy and red clover and have added to these other acres since, until now my farm is all in grass but about forty acres; the result is I have more horses than I can ride, have long since made my parting salaams to the mortgage fiend, am beginning to suspect that I may in time become one myself, as I frequently catch myself asking the question if the usury laws which prevent us from charging our neighbors two per cent a month for the use of our surplus cash may not after all stand in the way of our best interests and highest possible development of the country.

Suppose any gentleman present should conclude to quit farming and embark in the mercantile business. Making a sale of his effects he finds himself with ten or twenty thousand dollars; he invests in dry goods and begins to sell them. He follows the same line of policy he did on the farm, that is, he continues day after day to draw from his shelves and throw on the market his original supply, never replenishing, never returning anything to his shelves, but from day to day living upon the proceeds of his sales; how long will it be until he is bankrupt? I venture the assertion, and defy contradiction, that no business on earth will stand as much mismanagement, as much neglect, as much exhausting and as little replenishing as farming. But even our richest soils will in time become impoverished, as one may plainly see by visiting some of the older hill fields of this county.

If at the end of thirty years we find what we at one time thought was an inexhaustible supply of plant food greatly diminished and a mortgage upon the remainder, what may we expect thirty years hence?

In the past we have not known what it was to lay out large sums annually for costly commercial fertilizers, hence we have been able to compete, although at a distance from the market, with the worn out fields of the east; and if we are wise and begin, ere it is too late, a judicious system of grassing our lands, we may restore the partially exhausted fertility of our soils.

Grass means stock, and stock means barn-yard manures, which may be utilized advantageously, but the chief fertilization will come from the grass itself.

If any one doubts this let him sow one of his fields to grass and after a few years break it up again, and he will be astonished at the yield of corn or wheat.

There is another advantage to be derived from grassing our lands; the product of our farms can thus be reduced to smaller bulk and shipped to market at less cost and in this way we may be able to beat the elevator combines, who at present have a monopoly of the grain business, and pay us just what they please.

There is one other advantage, in my judgment, to be derived from the grassing of lands, in the stating of which I know I am running counter to the generally accepted theory; it is this: the restoration of the underground water supply to our wells and springs. It is a well established fact that as countries get older and are brought under the dominion of the plow, springs and wells dry up.

In the early settlement of Illinois the prairie portions were found to be almost one continuous swamp or bog, and good wells could be had by sinking from five to fifteen feet almost anywhere, the country could not be farmed successfully until it was tiled, and these tilings ran full and flush with water the year round like so many living springs, but I am informed by parties from there that of late years those tile ditches are dry nearly all the time, that the wells have had to be sunk deeper and that the country is surely getting drier.

If then, as according to the accepted theory, more of the rainfall is absorbed into the ground after it has been broken and plowed than before, why do not those tile ditches show an increased water flow, and the wells hold out their water supply?

In 1841 my father emigrated to what was then known as the "Platte purchase" in Missouri. We found almost every draw or swale running flush with "spring branches," as they were called, and wherever there were pools of water deep enough, we found an abundance of fish, proving conclusively that the supply of water in those draws and pools must have been constant or fish could not have grown and lived there.

In fifteen years those draws had all become dry, except immediately after rains, and where used to be bold running streams none are now found, and wells that once furnished an abundance of water at a depth of fifteen and twenty feet below the surface have entirely failed and have had to be dug deeper. When I settled in this county in 1862 I thought then it was the best watered country I had ever seen. Now I can take any one to dozens of places in a radius of ten miles where bold flush springs used to run and he will find them as dry as a powder house.

Mr. F. W. Ingham, the proprietor of our windmill and well factory, and whom I consider the best authority in our county upon the subject of water supply, informs me that there are very few wells of ten years' standing in this county but have either gone entirely dry, or show a permanent decrease in water supply, while he has constant calls to sink wells deeper in search of water where the supply was at one time thought to be inexhaustible. I found on my farm, when I settled it, a number of "wet weather" springs, and also some I considered permanent, before the prairies on the highlands above me were broken; since those uplands have been brought under cultivation my "wet weather" springs have all dried up, and I can cultivate right over the land where they were, and the permanent springs show a decreased flow. Again I ask, if a larger per cent of the rainfall enters the earth now than did before the sod was broken, and the amount of the rainfall has increased as these self-styled *learned* men tell us, why do we not find more "wet weather" springs and a greater supply in our wells and permanent springs?

It devolves upon the wiseacres, who believe in the established theory that the rainfall and rain absorption is increasing, to answer these questions and account for the well established fact that countries get drier as they get older.

I know we have some gentlemen, with the handle of professor to their names, who have made the remarkable discovery, and tell us in a very learned way that a cubic foot of earth taken from a wet cornfield has been found to weigh more than a cubic foot of earth taken from a dry prairie, and hence plowed ground absorbs a greater per cent of the rainfall than grass lands; and to the superficial thinker this will at first sight appear true. But this theory cannot account for the facts as we find them; that floods are becoming more frequent in our water courses, and that the underground runs and reservoirs of water, which must receive their supply from surface absorption, are drying up and failing.

I have this theory, which I think the facts warrant: that when the surface of the earth is covered with grass, every tiny stem and spire acts as a miniature dam to check and retard the flow of water; that after a rain the water finds its way to the draws and water courses more slowly. Thus more of it has time to become absorbed, every root and fibre acting as conductors to lead it into the ground, just as straws slanted the wrong way will lead water into a wheat stack; hence more water in our wells and springs, and disastrous floods become less frequent.

Break the sod and the grass roots decay and you destroy the conductors. What rainfall does not flow away to make floods is retained near the surface and the lower earth or subsoil becomes dry and your wells fail.

I have been asked, what will renters do who are not able to follow grass farming, which necessitates the keeping of stock? I will answer, he will have to go on skimming the ground and raising cockleburs and tramps unless the owners of the land have sufficient good sense to make other terms with them and furnish them with stock.

A man who commenced thirty years ago to make his farm finds himself now, if he has been economical, with a comfortable home, and if he has acted wisely, with good improvements and preserved fertility of soil; but he also finds he is getting old and not able to work as he once did; he wants to retire; he is offered four or five hundred dollars a year by some strong young man for the use of his farm, a bargain is made, and the sapping process is commenced.

The farm is worth ten thousand dollars, it represents the old man's capital; he gets five hundred dollars per annum, or five per cent; but at the end of a few years he begins to realize that it is not the *interest* on his principal that he has been receiving and eating up, but a part of the principal itself. He finds his farm run down; what were once fertile fields, now poor and seeded to noxious weeds; the improvements dilapidated, and, in fact, the farm not worth in the market near as much as when he left it. He finds, in fact, that he has not been living on what his renter paid him as he supposed, but that he has actually been eating up his own reserved capital.

Hence if our wealthy retired farmers will be wise in time they will grass their farms, stock them up, and place them in the hands of trusty men on shares, thus holding a certain right of supervision that will not only enable them to preserve the fertility of their lands, but in the end receive a greater dividend upon their investment.

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